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Oxygen-Activated Sludge Plant Completes Two Years of Successful Operation

Air Products and Chemicals, Inc, Allentown, Pa

Prepared for

Municipal Environmental Research Lab, Cincinnati, Ohio Wastewater Research Div

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OXYGEN-ACTIVATED SLUDGE PLANT COMPLETES TWO YEARS OF SUCCESSFUL OPERATION

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OXYGEN-ACTIVATED SLUDGE PLANT COMPLETES TWO YEARS OF SUCCESSFUL OPERATION

by

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Contract No. 68-03-0405

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FOREWORD

The Environmental Protection Agency was created because of increasing public and government concern about the dangers of pollution to the health and welfare of the American people. Noxious air, foul water, and spoiled land are tragic testimony to the deterioration of our natural environment. The complexity of that environment and the interplay between its components require a concentrated and integrated attack on the problem.

Research and development is that necessary first step in problem solution and it involves defining the problem, measuring its impact, and searching for solutions. The Municipal Environmental Research Laboratory develops new and improved technology and systems for the prevention, treatment, and management of wastewater and solid and hazardous waste pollutant discharges from municipal and community sources, for the preservation and treatment of public drinking water supplies, and to minimize the adverse economic, social, health, and aesthetic effects of pollution. This publication is one of the products of that research; a most vital communications link between the researcher and the user community.

The case history documented herein makes available to the sanitary engineering community design details and considerations, construction and startup experiences, capital and operating costs, and two years of operating and performance data for the first full-scale municipal oxygen-activated sludge wastewater treatment plant in this country.

Francis T. Mayo, Director
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ABSTRACT

An OASES[R] oxygen-activated sludge secondary wastewater treatment system has been in operation at Fairfax County, Virginia's Westgate treatment plant since October 1971. This report covers the two-year operating period of October 1971 through September 1973, including startup, optimization, routine operations, and operation during upsets. The Westgate plant was converted to oxygen from an existing aeration-sedimentation system operated without sludge recycle. At a cost of $1,700,000, Fairfax County upgraded Westgate from what was essentially a 0.35-m^3/sec (8-mgd) primary treatment facility achieving approximately 50 percent BOD_5 removal to a modern 0.61-m^3/sec (14-mgd) oxygen-activated sludge system achieving on the average 92 percent BOD_5 removal efficiency. Effluent concentrations of 10 to 15 mg/l total BOD_5, less than 5 mg/l soluble BOD_5, and less than 20 mg/l total suspended solids (TSS) have been routinely achieved. The plant has demonstrated a stability of operation and performance not generally available with other biological treatment processes.

This report was submitted in fulfillment of Contract No. 68-03-0405, by Air Products and Chemicals, Inc., under the sponsorship of the U.S. Environmental Protection Agency.

OASES[R] is a registered trademark of Air Products and Chemicals, Inc. of Allentown, Pennsylvania. It is used in connection with sewage treatment plants of Air Products' designs utilizing oxygen instead of air to aerate the sewage.

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SECTION I

INTRODUCTION

A detailed report of the conversion to and operational performance of an oxygen-activated sludge system at the Westgate wastewater treatment plant in Fairfax County, Virginia, is given in this report. It is presented in the form of a case history including the time span leading up to and following the decision by the County to convert to oxygen-activated sludge.

Available design and performance data for the original aeration-sedimentation system is presented as well as data for the chemical and chemical/carbon systems which were employed to upgrade plant performance prior to the decision to use oxygen-activated sludge. The need for a high efficiency wastewater treatment system and the decision to employ oxygen-activated sludge at Westgate are discussed and followed up with details on the design, construction, startup, operation, performance, and costs of the oxygen-activated sludge system.

An important aspect of this report is a comprehensive presentation of startup and performance data generated over two years of operation (October 1971 through September 1973) of the Westgate oxygen system.

SECTION II

CONCLUSIONS

The OASES^{R} system at the Westgate wastewater treatment plant of the County of Fairfax, Virginia, was the first commercial installation of an oxygen-activated sludge system at a municipal facility. This report is intended to provide an opportunity to review and assess its merits under field operating conditions.

The information contained in this report has been taken from the Fairfax County records and has been correlated for convenient evaluation in case history form, but is otherwise unaltered. The report presents an opportunity for interested engineers to examine and evaluate the data obtained by Westgate plant personnel over the two-year operating period of October 1971 through September 1973. This operating period includes startup, optimization, routine operations, and operation during upsets.

Principal conclusions emanating from the Westgate experience with oxygen-activated sludge treatment are listed below:

1. Conversion of Fairfax County, Virginia's Westgate treatment plant to oxygen-activated sludge permitted a timely, reliable, and cost effective method of upgrading the plant to meet current and future treatment requirements.

2. The practicability and benefits of using high purity oxygen in the activated sludge process have been demonstrated at the Westgate Treatment Plant during the two-year operating period covered by this report.

3. Overall treatment plant BOD removal efficiencies averaging 92 percent exceeded performance specifications over a range of biomass loadings from 0.2 to 0.8 kg BOD_5/day·kg MLVSS (lb/day·lb).

4. Operational integrity of the converted Westgate Plant has been outstanding. Problems encountered such as mechanical failures associated with primary and secondary clarifiers, sludge disposal bottlenecks associated with vacuum filter breakdown, and the occurrence of toxicity in the wastewater have not seriously affected the performance of the oxygen-activated sludge process. When upset has occurred, the process has demonstrated rapid recovery over a period of one to two days.

5. Oxygen requirements for the process have been slightly lower than anticipated, the normal weekly averages ranging from 0.7 to 1.0 kg O_2 supplied/kg BOD_5 removed (lb/lb). In the extreme, values from 0.6 to 2.1 kg O_2 supplied/kg BOD_5 removed (lb/lb) have been observed.

6. Sludge production from the oxygen-activated sludge process exclusive of primary sludge and weir losses was approximately 0.42 kg TSS/kg BOD_5 removed (lb/lb) during a process optimization program undertaken from January to May 1972. Overall sludge production during the same optimization program including primary and secondary sludges, but not weir losses, was approximately 0.76 kg TSS/kg BOD_5 removed (lb/lb). However, following the optimization program, overall sludge production, again excluding weir losses, averaged 1.4 kg TSS/kg BOD_5 removed (lb/lb) for the long-term operating period of June 1972 to September 1973.

7. Sludge properties have been very stable. SVI values excluding startup range from a daily low of 35 to a high of 110 ml/g TSS. ZSV values which are sensitive to MLVSS levels varied from 0.6 to 4.2 m/hr (2.0 to 13.8 ft/hr) on a weekly average basis.

8. Sludge dewaterability of decanted waste oxygen-activated sludge combined with primary sludge exceeded that anticipated for combined air-activated/primary sludges. A two-year average yield of 21.5 kg/m^2·hr (4.4 lb/ft^2·hr) was achieved on Westgate's vacuum coil filters with a filter feed containing at least 6 percent solids.

9. Costs associated with the operation and maintenance of the Westgate wastewater treatment plant were 3.3 cents/m^3 (12.5 cents/1000 gallons) for the 1973 oxygen system as compared with 1.8 cents/m^3 (6.8 cents/1000 gallons) for the aeration-sedimentation system still in use in 1968 and 4.2 cents/m^3 (15.9 cents/1000 gallons) for the chemical treatment system temporarily employed in 1971. All systems operated at a plant influent flow of approximately 0.46 m^3/sec (10.4 mgd) and achieved total plant BOD_5 removal efficiencies averaging 92 percent, 52 percent, and 71 percent for the oxygen-activated sludge, aeration-sedimentation, and chemical treatment systems, respectively.

10. The effects of temperature on the oxygen-activated sludge process in terms of effluent quality, sludge properties, and secondary clarifier performance have been negligible at Westgate.

The performance record of the Westgate oxygen system has been excellent. Although it was originally intended only to satisfy the County's interim treatment requirements, it has substantially exceeded bid performance specifications. It stands as an example of the effluent quality and performance reliability that can be achieved through the use of oxygen in the activated sludge process.

SECTION III

RECOMMENDATIONS

The conversion of the Westgate wastewater treatment plant to oxygen-activated sludge represented the application of new technology to solve an existing problem as quickly as possible. The results were excellent. As in any project of this type and size, however, there were certain aspects of the design, construction, operational, and demonstration phases of the program which might have been done differently in retrospect. The following recommendations are intended to help the engineer who is designing a wastewater treatment plant using an oxygen-activated sludge system avoid some of the relatively minor problems encountered at Westgate:

1. The cocooning technique used for sealing the aeration basin at Westgate is recommended as an effective method of sealing older porous concrete structures when existing aeration basins are to be modified to oxygen-activated sludge service.

2. Careful design of sludge recycle systems is recommended. Improper sizing may lead to poor solids inventory control in the clarifier and oxygenation basin. Recycle systems for oxygen-activated sludge systems should be capable of pumping sludges of from 1.5 to 4.0 dry weight percent solids at from 10 to 50 percent of the design influent flow rate.

3. Design of covers and gas seals for new oxygenation basins or for conversion of existing basins should include careful consideration of thermal expansion to avoid formation of oxygenation gas leaks and shearing of holddown fixtures.

4. When it is anticipated that liquid oxygen vaporizers will receive heavy usage in a high humidity environment such as experienced at the Westgate plant, the use of pylon mounted vaporizers with liberal provision for air circulation is recommended. This minimizes problems of icing and avoids problems with galling and subsequent deterioration of a concrete slab base.

5. The oxygen-activated sludge system at Westgate demonstrated excellent performance even with excessive secondary clarifier sludge blanket depths. It is recommended, however, that sludge blanket depths be maintained between 0.3 and 0.6 m (1 and 2 ft) and that excess sludge not be stored in the clarifier unless it is impossible to waste from the system.

6. Subjects which might warrant further investigation with regard to the overall capabilities and performance characteristics of the Westgate oxygen-activated sludge system include more extensive studies of sludge production and solids balances around the system, and the potential of the Westgate system to nitrify if operated at appropriate sludge ages.

7. Finally, a visit to the Westgate wastewater treatment plant is recommended, if possible. Such a visit will help the design engineer or municipal engineer appreciate the outstanding attributes of oxygen-activated sludge systems.

SECTION IV

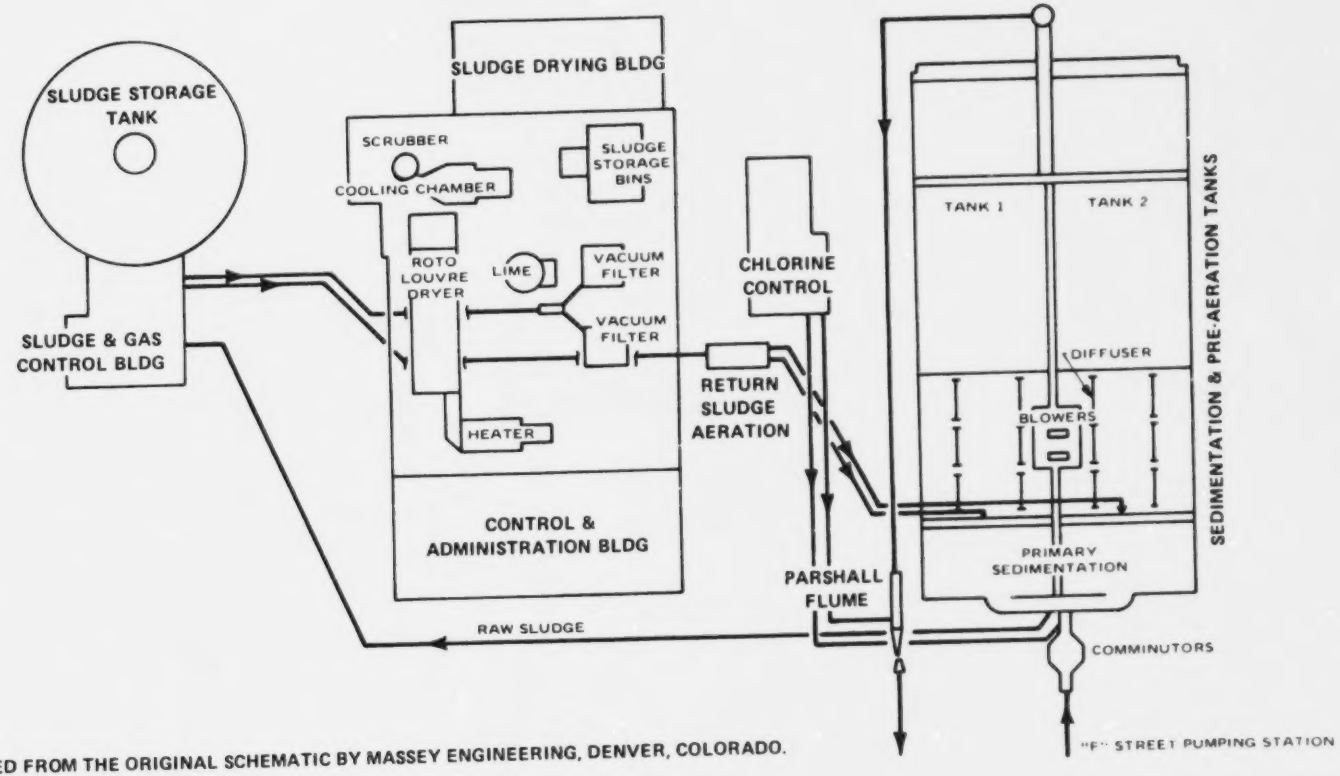
HISTORY OF THE WESTGATE WASTEWATER TREATMENT PLANT

Fairfax County operates four wastewater treatment plants; the Westgate, Little Hunting Creek, Dogue Creek, and Lower Potomac plants (Figure 1). In early 1970, the treatment provided by the Westgate, Little Hunting Creek, and Dogue Creek plants was deemed inadequate and an interim upgrading program for these three plants was undertaken by Fairfax County as outlined in a report to the State Water Control Board (1). The program included eventual phase-out of all three of the above plants upon completion of upgrading the Lower Potomac plant and expansion of a nearby facility in Alexandria, Virginia. It also provided for interim modifications of the Westgate facility to provide the effluent quality required to avoid the imposition of a building moratorium on portions of Fairfax County. According to the original program, flows from the Dogue Creek plant and Hunting Creek plant were to be diverted to the Lower Potomac plant and flows from the Fairfax County Westgate plant were to be diverted to the previously mentioned nearby facility in Alexandria, Virginia, by 1975.

The Westgate Treatment Plant was constructed in 1954 by Massey Engineers of Denver, Colorado. The plant was designed for a capacity of 0.35 m^3/sec (8 mgd) or 80,000 people and was designed to remove 50 percent of the BOD_5 in the influent wastewater. Special features of the plant included sludge handling facilities for drying and pelletizing sludge and a semigraphic instrumentation panel for centralization of supervisor control. The original plant is depicted schematically in Figure 2 and unit processes are described in Table 1.

The basic treatment process of the original plant consisted of comminution, bar screening, primary sedimentation, and aeration of the primary effluent followed by secondary sedimentation. A longitudinal cross section of the original process basin configuration is shown in Figure 3. Special scraper chains passed along the entire bottom of the system through all three sections of the basin. The apparent intention of the scraper was to return settled particles, whether grit or biological solids, from the secondary clarification section to the primary section of the basin. Although Westgate was not intended to operate as a conventional activated sludge system, some settled solids were presumably resuspended in the aeration zone, thus keeping some active biomass in the system. Installation of separate sludge hoppers and scrapers in the secondary clarification section for capture and recycle of settled sludge to the front of the aeration section was considered and abandoned for lack of funds at the time of construction. The purpose of the aeration section as finally designed in 1954 was mainly to replenish dissolved oxygen (DO) levels in the primary effluent prior to final clarification, chlorination, and discharge.

FIGURE 1. WASTEWATER TREATMENT PLANT LOCATIONS, FAIRFAX COUNTY, VIRGINIA



ADAPTED FROM THE ORIGINAL SCHEMATIC BY MASSEY ENGINEERING, DENVER, COLORADO.

FIGURE 2. ORIGINAL WESTGATE WASTEWATER TREATMENT PLANT

TABLE 1. DESCRIPTION OF ORIGINAL WESTGATE PLANT EQUIPMENT

I. Sedimentation and Preaeration Tanks:

2--Tanks each 160 ft long x 40 ft wide x 12 ft SWD

Aeration Equipment:

2--Blowers and Motors, each a 60 hp and 1,500 cfm unit
12--Swinging air diffuser units

Sludge and Scum Collecting Equipment:

4--Longitudinal Link-Belt sludge collectors
2--Traverse Link-Belt sludge collectors
2--Sludge valves continuous flow adjustable weir
4--Primary and secondary scum collectors

II. Parshall Flume - 36 inch throat with chlorinated control float well

III. Return Sludge Aerator:

Stored sludge could apparently be aerated in this tank prior to return to the primary sedimentation tanks and subsequent recycle with raw primary sludge

IV. Chlorine Control Building:

2--Wallace and Tiernan chlorinators, 1,500 lb each, for pre- and post-chlorination of effluent and returned sludge

V. Sludge Storage Tank:

1--65 ft diameter x 23 ft SWD tank with floating cover and gas collecting dome. Sludge storage capacity - 30 days
Reportedly never used as an anaerobic digester

VI. Sludge Drying Building:

Sludge well under floor with decanting well and weir

2--8 ft diameter Komline-Sanderson vacuum sludge filters

"Roto Louvre" dryer

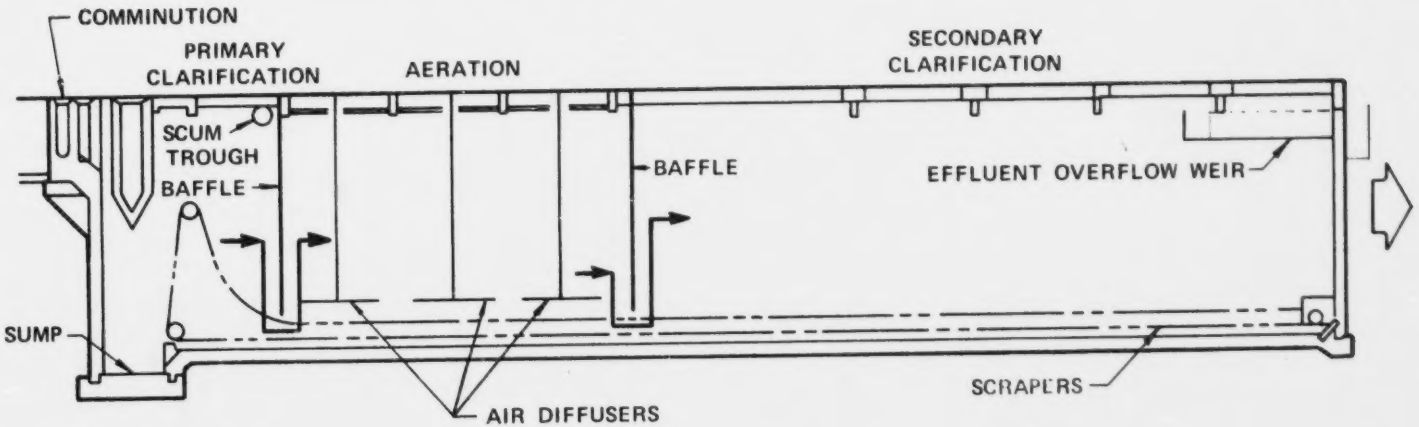
Oil-fired heater, air blast to dryer at 850°F, capacity approximately 9,923,000 BTU

Oil Scrubber "Pease Anthony", 6 ft diameter x 20 ft high, removing odor from Roto-Dryer exhaust air, 10,500 cfm

VII. Control and Administration Building:

Housing graphic panel and control centers "A" and "B" and machine shop in the basement, chemical laboratories on the second floor with administrative offices and records, and utility and locker rooms on the first floor.

Note: 1 ft = 0.305 m
1 in = 2.54 cm
1 cfm = 0.472 l/sec
1 BTU = 1.055 kJ
1 lb = 0.454 kg



ADAPTED FROM "OPERATIONAL EXPERIENCE AT A COMMERCIAL OXYGEN ACTIVATED SLUDGE PLANT," ROBSON ET AL., PRESENTED AT THE 45TH ANNUAL WPCF CONFERENCE, ATLANTA, GEORGIA.

FIGURE 3. ORIGINAL WESTGATE BASIN CONFIGURATION – LONGITUDINAL SECTION

The original system performed adequately, providing partial treatment for 0.35 m^3/sec (8 mgd) of wastewater for nearly 16 years. Average BOD_5 removal efficiencies, suspended solids removal efficiencies, and plant flows are presented in Figure 4 for every fifth year through 1970.

Sludge handling, dewatering, and pelletizing equipment performed adequately, but problems were encountered with odor from these operations. Eventually, due to a lack of a market for the pelletized sludge, the system for sludge drying and pelletizing was abandoned.

By 1970, increased flows and plant loadings led to BOD_5 removal efficiencies of less than 50 percent at the Westgate Treatment Plant. A record of averaged flows and BOD_5 loadings for every fifth year from 1955 through 1970 is shown in Figure 5. Heavy chlorination of the influent wastewater was employed when necessary from 1954 to June 1970 to upgrade treatment efficiency and to minimize odors in the plant; chlorination dosages were heavy enough at times to give the primary sludge a bleached, whitish appearance.

In 1970, Fairfax County was faced with the choice of either upgrading the efficiency of the Westgate plant or having a building moratorium placed on the area served by the plant. In June of that year, Fairfax County submitted a report to the State recommending interim modifications to upgrade treatment efficiency at the Westgate plant and eventual termination of operations at the Westgate, Little Hunting Creek, and Dogue Creek plants.

Initially, Fairfax County decided to upgrade the Westgate Treatment Plant with chemical treatment (2). Laboratory and plant-scale tests were conducted during June and July 1970 to determine the effectiveness of chemical treatment and the optimal points of chemical addition to the wastewater. Points of chemical addition studied are shown in Figure 6. Dosage requirements established were about 3,778 kg $FeCl_3$/day (8,340 lb/day) with about 0.001 kg anionic polyelectrolyte/m^3 wastewater (8.34 lb/mil gal).

Installation of permanent equipment for chemical treatment included a 94.6-m^3 (25,000-gal) storage tank and a metering pump for ferric chloride and two 1.5-m^3 (400-gal) steel mixing tanks, a metering pump, and two 0.56-kw (0.75-hp) agitators for the polyelectrolyte. The performance of the Westgate plant using ferric chloride and anionic polyelectrolyte chemical treatment was improved over the performance of the original plant in removing BOD_5, but sludge handling was made more difficult. Table 2 contains the monthly average influent and effluent BOD_5 concentrations during chemical treatment. The resulting sludge was of different character and more difficult to dewater than that of the original plant.

Activated carbon addition combined with chemical treatment was also employed at Westgate in an attempt to further increase removal efficiencies. Laboratory-scale tests were conducted and indicated that carbon treatment could provide about 75 percent BOD_5 removal. As a backup for ferric chloride and polyelectrolyte treatment, Fairfax County installed full-scale equipment for activated carbon storage and addition; this included a 189.3-m^3 (50,000-gal) storage tank, a 30-kw (40-hp) impeller mixer, and a metering pump.

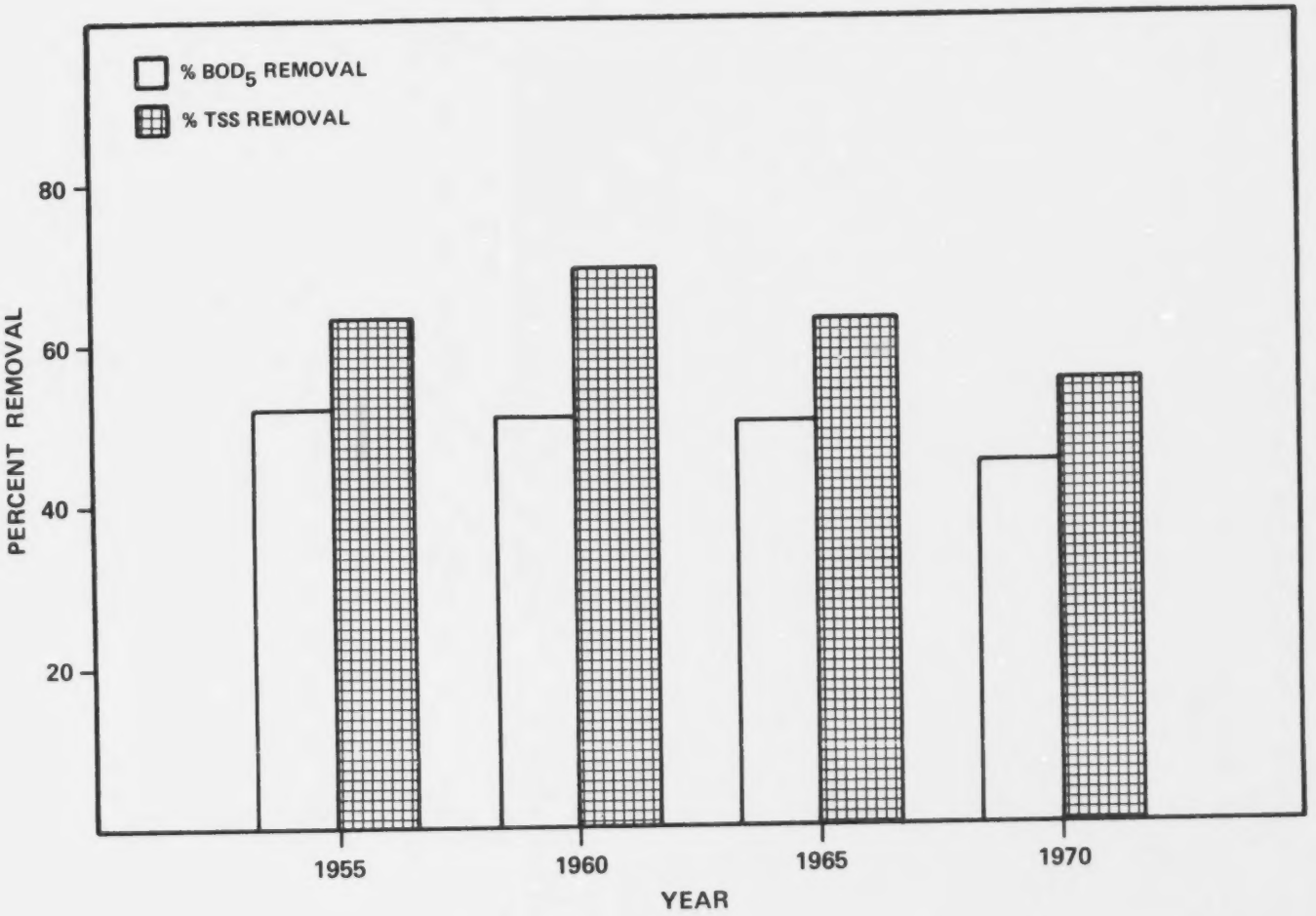


FIGURE 4. PERCENT BOD_5 AND TSS REMOVAL EFFICIENCIES FOR WESTGATE

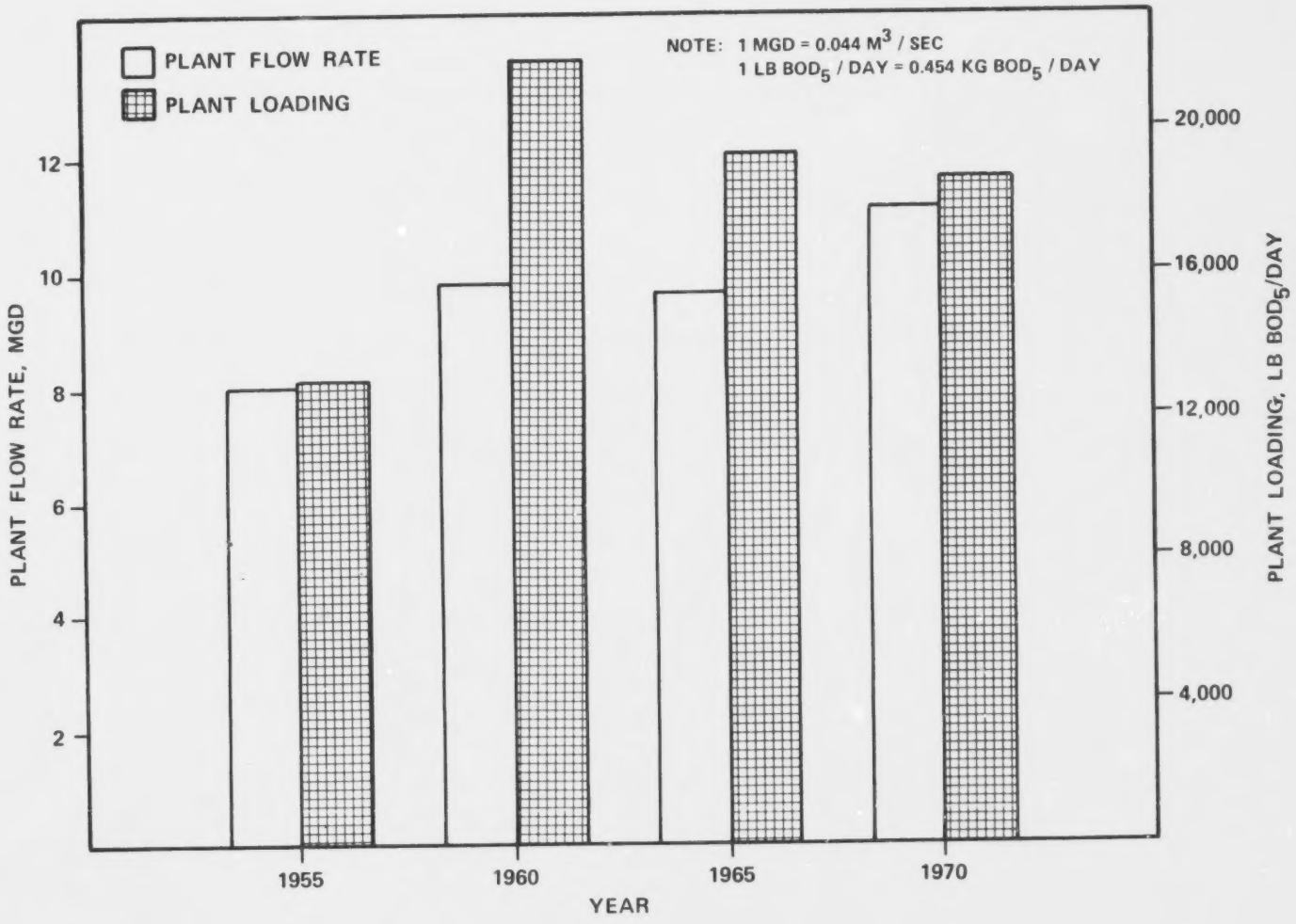


FIGURE 5. AVERAGE WESTGATE LOADING AND FLOW RATE DATA

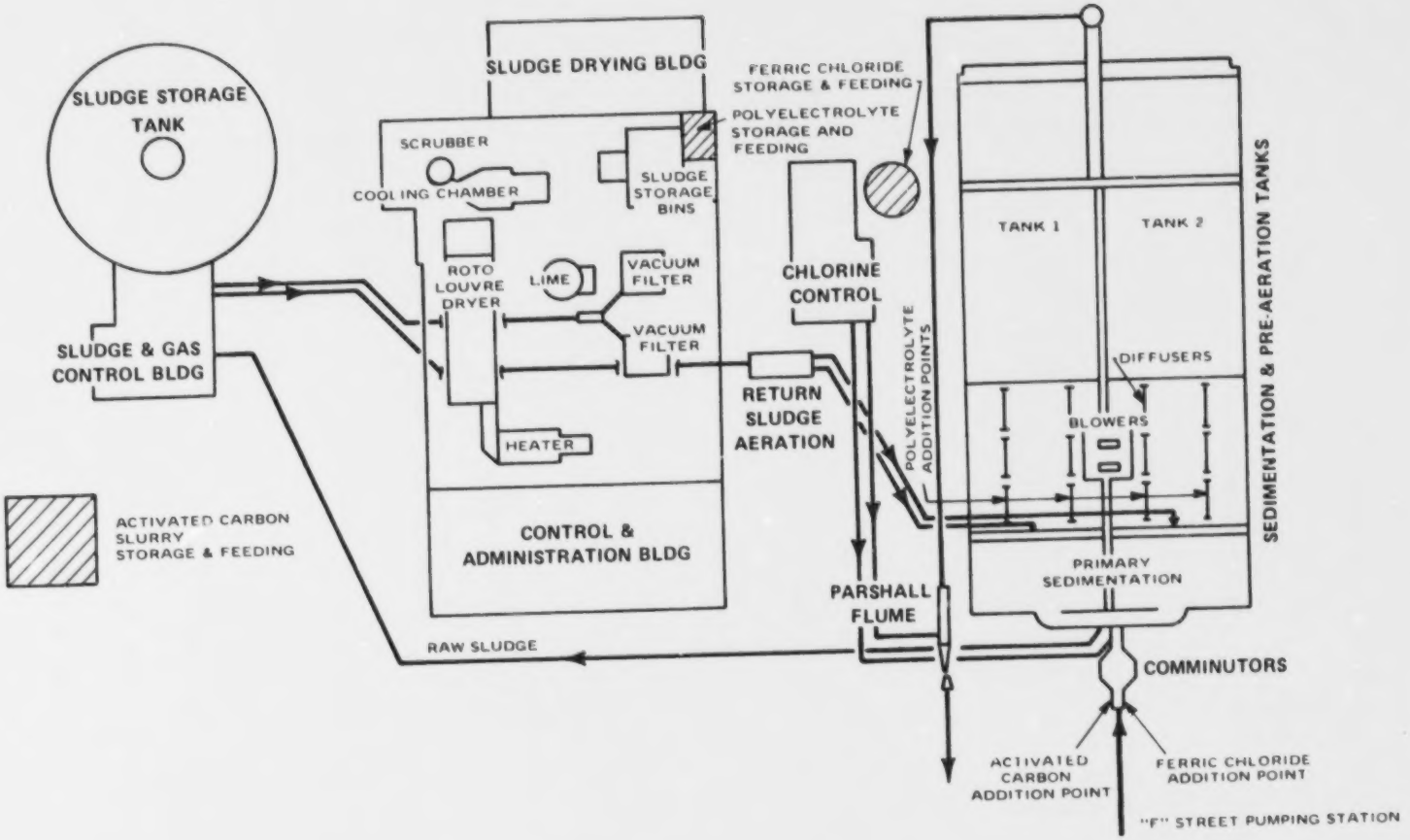


FIGURE 6. WESTGATE CHEMICAL STORAGE FACILITIES AND POINTS OF CHEMICAL ADDITION

TABLE 2. WESTGATE CHEMICAL TREATMENT PERFORMANCE - MONTHLY AVERAGE DATA[a]

Month	Avg. Monthly Flow, mgd	BOD_5 Influent, mg/l	BOD_5 Effluent, mg/l	Percent Removal
Jan 1970	12.5	223	121	48
Feb	12.3	188	109	42
Mar	10.9	219	122	44
April	11.7	179	88	51
May	10.6	169	86	49
June	10.0	210	137	35
July	10.1	195	73	63[b]
Aug	9.3[c]	215	77	64
Sept	8.9[c]	230	91	60
Oct	8.8[c]	222	68	69
Nov	8.3[c]	187	41	78
Dec	7.8[c]	192	45	77
Jan 1971	7.7[c]	174	41	76
Feb	6.7[c]	156	46	71
Mar	5.0[c]	168	48	71
April	8.5[c]	171	44	74
May	11.2	155	41	74
June	12.9	157	37	76
July	11.9	200	45	78
Aug	10.9	209	64	64[d]
Sept	6.2	204	51	75
Oct	8.7	177	56	68[d]
Nov	10.3	174	43	75[e]
Dec	12.6	165	32	81

(a)Data taken from a report prepared by Engineering-Science, Inc. (2).
(b)Chemical addition began.
(c)Flows were purposely reduced to facilitate infiltration TV surveys and repair of sewers.
(d)Plant modifications disrupted treatment.
(e)Activated sludge plant modification became operational.

Note: 1 mgd = 0.044 m^3/sec

Erosion and control problems were encountered with the activated carbon facility from the onset of its operation, and carbon addition to the Westgate facility was abandoned on July 16, 1971, with inconclusive treatment results.

Although removal efficiencies had improved with chemical treatment, an evaluation conducted by Fairfax County indicated that the capital and operational costs associated with a biological treatment system were favorable compared with the anticipated operational expenditure for continued chemical treatment. Fairfax County and Engineering Sciences, Inc., consultant to the County, thus considered alternatives for interim conversion and upgrading of the Westgate Treatment Plant to biological treatment. Oxygen-activated sludge and high-rate air-activated sludge were the two systems considered. Because the use of oxygen-activated sludge promised low sludge production, minimum capital costs, and high BOD_5 removal efficiency, and because prospects for converting the Westgate facility to oxygen within the existing tanks were attractive (with the exception that two new secondary clarifiers would be required), oxygen was chosen.

Having selected the oxygen process as the best practical solution to the problems facing the County, the consulting engineer recommended the following modifications to the Westgate Plant:

A. Installation of an oxygen-activated sludge system capable of treating 0.61 m^3/sec (14 mgd) at an influent concentration of 220 mg/l BOD_5 in the 1.6 hr residence time available in the existing concrete tanks, leaving the primary clarifier section intact,

B. Installation of two secondary clarifiers each 36.6 m (120 ft) in diameter, 3.34 m (11 ft) deep, and equipped with center inlet flow and peripheral weir effluent overflow,

C. Additional sludge handling capability in the form of two flotation thickeners, each having a surface area of 23.2 m^2 (250 ft^2), and

D. Installation of a sludge recycle system consisting of two recycle pumps having a capacity of 0.31 m^3/sec (7 mgd) each and sludge wasting pumps, flowmeters, and associated piping.

On January 23, 1971, the County of Fairfax, Virginia, received competitive bids for conversion of the existing aeration basins at the Westgate facility to an oxygen-activated sludge system. Previous bids had already been let for the addition of the two 36.6 m (120 ft) diameter clarifiers, the addition of recycle piping and other piping modifications, and installation of the two flotation sludge thickeners.

Design conditions for the oxygen-activated sludge systems as given in the bid specifications are shown in Table 3. The successful bidder was selected on the basis of lump sum price, time for completion, and guaranteed efficiency of BOD_5 removal.

TABLE 3. BID SPECIFICATIONS

Item	Number
Influent BOD_5	220 mg/l
Influent TSS	173 mg/l
BOD_5 Removed in Primary	10%
Design Temperature (minimum)	15°C
Design Flow Rate	14 mgd (0.61 m^3/sec)
Overall BOD_5 Removal Required	80%

Air Products and Chemicals was awarded the contract for the Westgate plant conversion. The bid price for conversion, installation, and spare parts for the OASES® process and equipment was $861,000. The time allowed to complete the contract was 210 days, and a removal efficiency of 80 percent of the influent BOD_5 was guaranteed.

The revised Westgate schematic including the oxygen-activated sludge system as bid is shown in Figure 7. A description of the equipment is presented in Table 4.

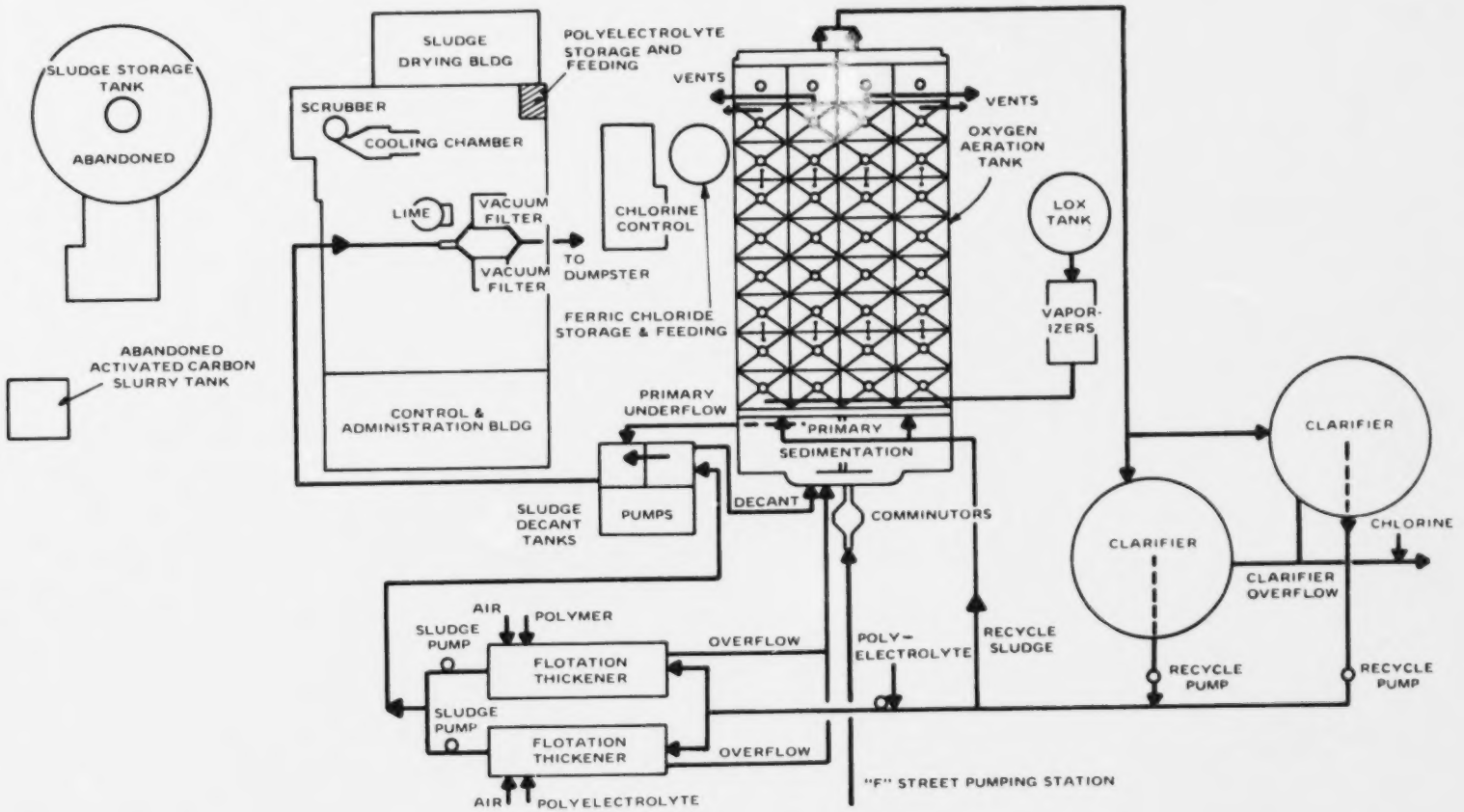


FIGURE 7. REVISED WESTGATE PLANT SCHEMATIC

TABLE 4. EQUIPMENT DESCRIPTION FOR REVISED PLANT

I. Primary Sedimentation and Oxygen-Activated Sludge Tanks:

2--Primary sedimentation tanks each 22 ft long x 41 ft wide x 12 ft SWD, volume each 10,800 ft^3

4--Oxygen system trains each 138 ft long x 20-1/2 ft wide x 12 ft SWD, volume each 33,750 ft^3

36--Mechanical aerators - 9 aerators per train, 2-10 hp and 7-5 hp

Liquid oxygen (LOX) supply system - 9600 gal capacity

II. Secondary Clarifiers:

2--Circular clarifiers - 120 ft diameter, 11 ft SWD
- center feed
- surface overflow rate 620 gpd/ft^2 14 mgd flow
- overflow weir length 690 ft each clarifier
- suction lift type sludge withdrawal

III. Flotation Thickeners:

2--Flotation thickening units with polyelectrolyte addition equipment, area each 250 ft^2

IV. Sludge Decant Tanks (added in an earlier construction program):

2--Sludge holding and/or decant tanks (each modified by addition of 5 hp mixer), volume each 25,000 gal

V. Chlorine Control Building:

2--Wallace and Tiernan chlorinators, 1,500 lb each, for pre-chlorination and/or disinfection of effluent

VI. Sludge Drying Building:

2--8 ft diameter Komline-Sanderson vacuum sludge filters (refurbished and new coils added), area each 200 ft^2

VII. Control and Administration Building:

Housing control centers and machine shop in the basement, chemical laboratories on the second floor with administrative offices and records. Utilities and locker rooms are located on the first floor.

Note:
1 ft = 0.305 m
1 lb = 0.454 Kg
1 gal = 0.0038 m^3
1 ft^3 = 0.028 m^3
1 ft^2 = 0.93 m^2
1 hp = 0.746 kw_3
1 mgd = 0.044 m^3/sec
1 gpd/ft^2 = 0.041 m^3/day·m^2

SECTION V

DESIGN CONSIDERATIONS FOR CONVERSION

Air-activated sludge systems have been operated for some 50 years, but have frequently been hampered by problems of insufficient DO in the mixed liquor. The application of oxygen to biological wastewater treatment systems has been studied by others (3,4,5,6) but the cost of high purity oxygen and the lack of efficient dissolution methods precluded successful economic application of oxygen to full-scale plants at the time. Since then the cost of oxygen generation has come down substantially, and appropriate means of achieving efficient utilization of oxygen in biological wastewater treatment systems have been devised.

In converting the Westgate plant to an oxygen-activated sludge system, the influent and primary sections of the plant were not modified. The influent is pumped from the collector system by an isolated pumping station through a force main to the plant. There is one other minor source of wastewater derived from an apartment complex nearby. The influent originally passed through comminutors and then a bar screen. Since initiation of the operation with the oxygen-activated sludge system, the comminutors have been removed. Rags are removed manually from the bar screen and deposited in a dumpster.

Influent then enters the two primary clarifiers through flow splitting channels. The primary clarifiers are equipped with surface skimmers and bottom flight chains which were rigged from the old equipment originally running the full length of the tank. Short detention times in the existing primaries at 0.61 m^3/sec (14 mgd) promote settling of only the more dense materials and the primaries seem to do little to change the character of the influent wastewater as received in the secondary system. This will be discussed in more detail in Section IX.

The wastewater flows to the oxygenation basin from the primaries through rectangular openings in the metal baffle which isolates the primary clarifiers from the oxygenation basin. Recycle sludge is returned to the oxygenation basin via a single 0.25-to 0.30-m (10-to 12-in) line from the newly installed recycle pump unit. The recycle sludge enters the basin at two points, one for each separate tank system. The mixed liquor thus formed flows through the oxygenation basins which are comprised of what was the aeration and secondary sedimentation sections of the existing concrete basin of the old plant.

The existing basin is divided into two separate and independent tanks. Each tank is further divided into two bays in the gas phase. Subsurface openings are present in a longitudinal dividing wall in each tank. This promotes mixing in the liquid phase between the two bays of each tank but segregates the gas phases of the two bays. During construction, each of the two tanks in the oxygenation basin was divided into four liquid stages by insertion of Placite (epoxy-phenolic resin) coated steel baffles. The resultant liquid stages (1-4) in each tank have volumes equal to 22, 44, 23, and 11 percent of the total volume of each tank, respectively. The superstructure of each bay was divided along its length into nine segments by structural members and to some extent dictated the staging configuration.

Figure 8 provides a view of the existing tank prior to conversion. Because the cross members of each bay were an integral part of the tank structure, these were not disturbed and,as a consequence, the number of aerators supplied equalled the number (36) of open segments in the top of the four trains.

The dissolution horsepower (220 total nameplate hp, 164 kw) is distributed uniformly throughout the basin with the exception of the first two aerators; the first two aerators of each bay are 7.46 kw (10 hp) units while all the other aerators are 3.73 kw (5 hp) units. The horsepower required in the latter segments of each train was dictated not by oxygen mass transfer requirements as is the case with the first stage, but rather by mixing requirements for maintaining the solids in suspension. In addition, it was desirable to maintain a minimum size aerator of 3.73 kw (5 hp) in these segments because of preferable quality and reliability in eqipment sizes. Consequently, the total horsepower required is higher than that which would be required for a grass roots installation where greater flexibility in tank structure would permit use of larger aerators in smaller numbers.

The gas-tight tank covers, which are required to achieve efficient utilization of oxygen in an oxygen-activated sludge system such as the OASES^{R} system, were fabricated from carbon steel and subsequently sand blasted to bright metal before coating with a proprietary Placite material to prevent corrosion. Each of the open segments in the concrete basin, excluding the last one in each bay, was covered with a separate aerator-support assembly and sealed individually to the concrete deck with bolts and silicon caulking compound.

The last segment of nine in each bay was left open to the atmosphere because it was anticipated that the activity in the mixed liquor of this segment, which also comprised the entire fourth liquid stage, would be sufficiently low that the 3.73-kw (5-hp) surface aerator with lower impeller employed to maintain mixing in the last segment of each oxygenation bay would be sufficient to transfer the oxygen required by the biomass from the atmosphere. The open last stage also facilitates sampling and observation of mixed liquor just prior to secondary clarification. Quiet baffles which prevent the aerator throw umbrella from reaching the effluent weir structure were installed in the fourth liquid stage to provide stable liquid level control within the covered basin.

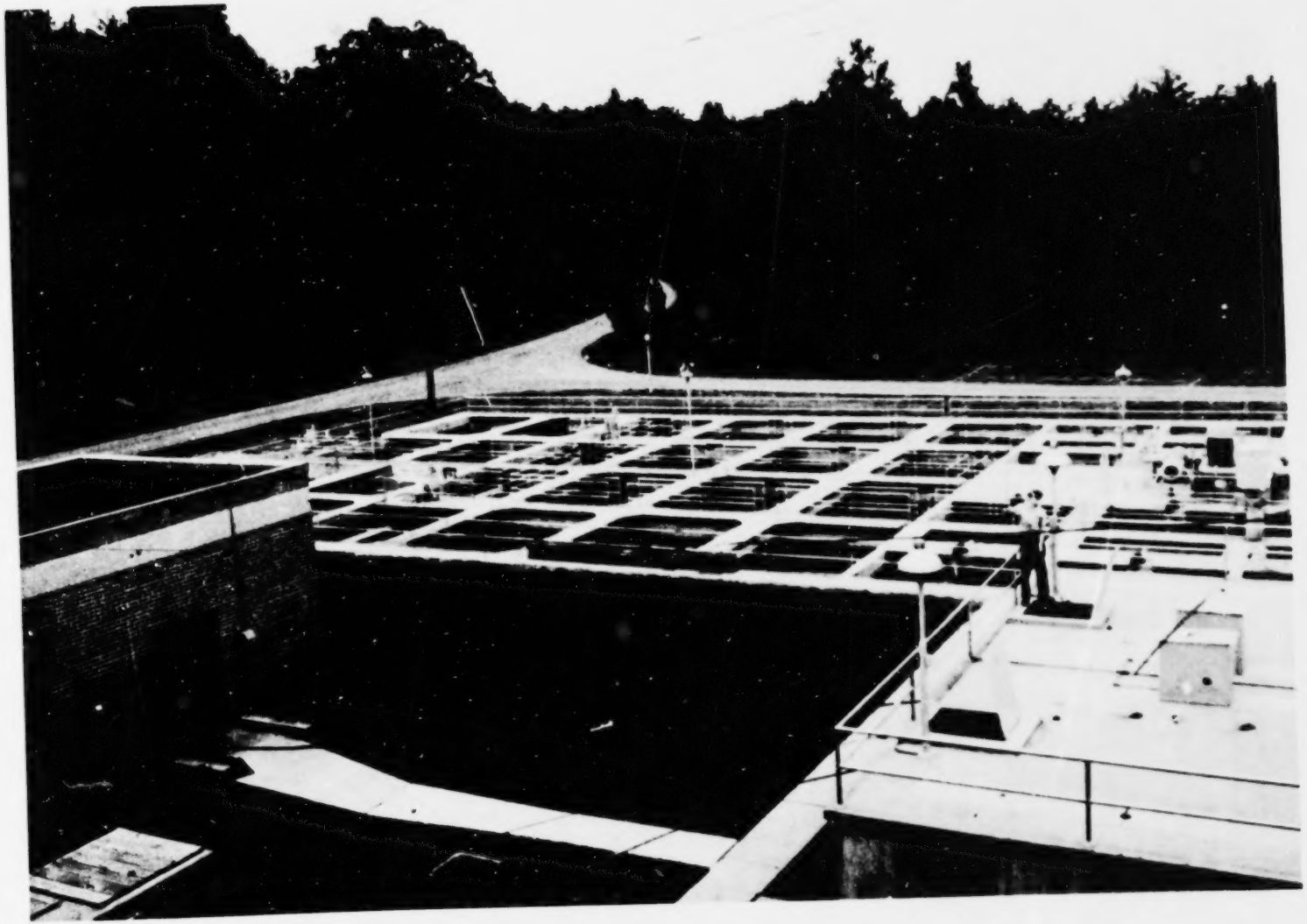


FIGURE 8. EXISTING CONCRETE BASIN PRIOR TO CONVERSION

Upon leaving the oxygenation basins, the mixed liquor flows from the two aeration tanks are combined and then distributed to the two secondary clarifiers through butterfly valves. The clarifiers are Walker units designed with center-feed influent wells and double-edge peripheral overflow effluent weirs. Sludge is withdrawn from the bottom of the clarifiers using suction lift scraper arms.

Two centrifugal sludge recycle pumps (one per clarifier) operate independently on the two clarifiers through separate return sludge lines. Early in plant operations, some problems were encountered with the sludge recycle system, and these will be discussed in the section on Startup.

Sludge wasted from the oxygen-activated sludge system was to be thickened in the two new 23.2-m^2 (250-ft^2) flotation thickeners; however, these thickeners were only utilized for the first few months of operation. They were taken out of service during the optimization program because thickening beyond that afforded by simple decant tanks was not needed. Thickening of secondary sludge in the decant tanks is aided by the addition of polyelectrolyte at the suction end of the secondary waste sludge pumps.

Waste secondary sludge is pumped to one of two sludge holding or decant tanks and decanted. Primary sludge which is held in a second tank is then mixed with the decanted thickened secondary sludge. The supernatant from the decant tank is returned to the primary basin, and the combined sludges are then filtered on two vacuum drum coil filters. These filters are part of the original plant equipment.

Lime and ferric chloride were added initially to improve the filtering properties of the sludge. Although some work was done with good success on dewatering the sludges without chemicals, as discussed in Section VII, lime and ferric chloride addition is still being practiced primarily to avoid odor problems and prevent further dewatering of the filtered sludge during transportation to the landfill site in dumpsters.

Oxygen supply considerations were based on interim operation of the Westgate Treatment Plant. The oxygen supply source chosen for the Westgate facility was liquid oxygen (LOX). Anticipated termination of operation at Westgate within three years of startup led to the selection of LOX despite its higher cost. The large initial investment for an on-site gaseous oxygen generator over a short operating period was economically less favorable.

The oxygen-activated sludge system at Fairfax was designed to operate either as a pure oxygen system or as an oxygen enriched air-activated sludge system. Special equipment used for the enriched air mode included an air blower and proportional air to oxygen control system. Automatic aeration basin vent control was utilized for the oxygen/air operation and manual vent operation for pure oxygen operation.

A minimum of process instrumentation was required for the oxygen system. Figure 9 is a simplified process instrumentation schematic for the system. It concentrates primarily on the oxygen inlet control system, which includes pressure indicating control valves, and the vent control system. Other instrumentation supplied with the OASES^{R}system including a purge blower system, the oxygen supply system with vaporizers, the pressure relief valves, the liquid oxygen storage tank, the sample taps for mixed liquor, and the sample taps for the gas phase are not shown in Figure 9.

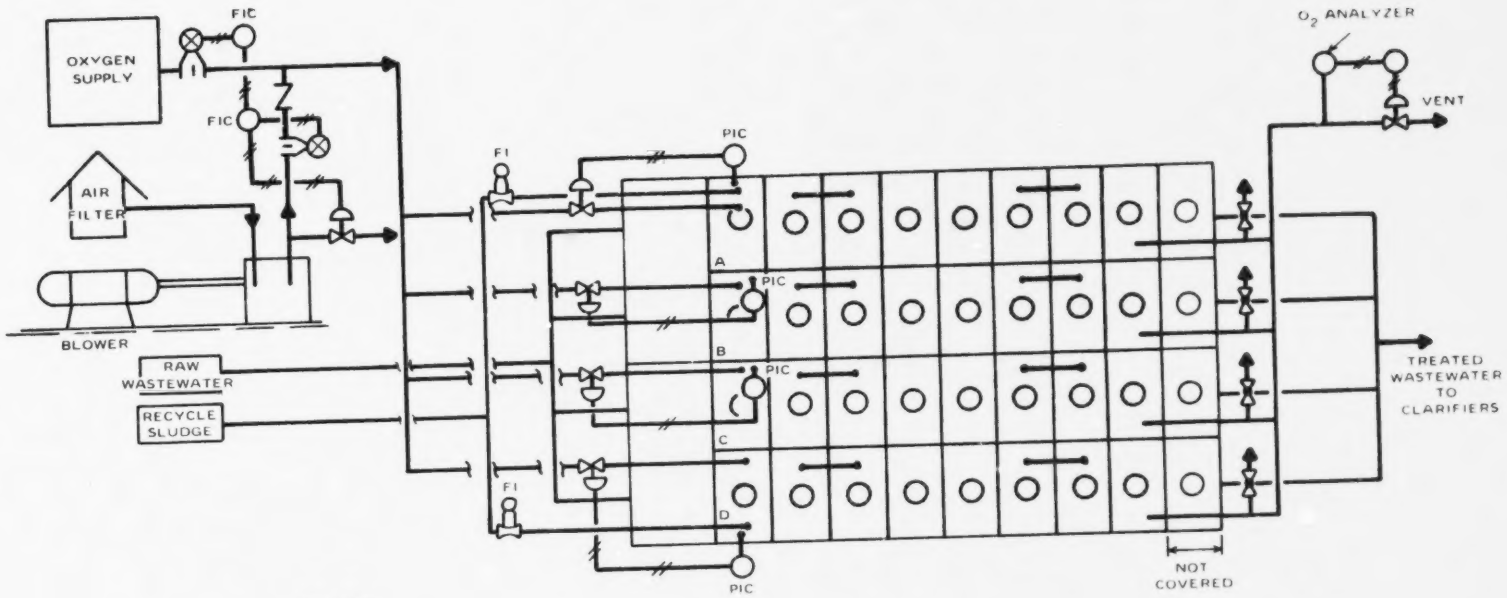
Safety considerations play an important role in influencing the design of plants where oxygen usage and human attendance is required. Air Products and Chemicals is concerned about safety and is well equipped to deal with safety matters. Although there has been some concern about the possibility of an explosion occurring within the covered basins of an oxygen-activated sludge system, the following points lead to the conclusion that this occurrence is highly unlikely.

Three ingredients are required for an explosion to occur: a fuel, oxygen, and an ignition source. The existance of an ignition source is highly improbable within the oxygen-activated sludge system. Such ignition sources as inductance and electrostatic spark can be ruled out because of the effects of the water saturated atmosphere within the tanks. Adiabatic gas compression is avoided by design and hot surfaces or impact sparks are conceivable but improbable because of the design criteria employed.

Combustible fuels are generally absent in oxygen-activated sludge systems; however, spills of hydrocarbon materials will occur in domestic and industrial situations, and these compounds may be carried into wastewater treatment facilities. Spills of fuel oil, for example, have been received at Westgate, but with no detrimental effects. In the event of spills, the less volatile oils, such as fuel oil, can be kept from the basin for the most part by skimming in the primary sedimentation tanks. More volatile hydrocarbons such as gasoline or methane (sewer gas) may also enter the system. To minimize the hazard with these fuels, purge blowers have been installed at the Westgate facility and other oxygen-activated sludge systems. With these, hydrocarbon vapors mixed with oxygen can be blown from the gas space within the covered aeration basin, if required, to eliminate the hazardous mixture.

Hydrocarbon monitoring systems are generally installed in oxygen-activated sludge systems to warn of an accumulation of hazardous mixtures within the covered aeration basin. At Westgate,a hydrocarbon analyzer was not included originally because of reasonable confidence that an ignition source was not present and that a water saturated atmosphere within the tank would eliminate chances of one ever existing. As an extra safety precaution, however, a new hydrocarbon analyzer and warning system has more recently been installed on the oxygen system at Westgate.

There are certain safety benefits of having the aeration basins covered. The covered basins of an oxygen-activated sludge system such as OASES^{R} minimize the danger of a man falling into the operating system. Aerosols containing potentially harmful bacteria and viruses are also minimized.



LEGEND

- CONTROL VALVE
- BUTTERFLY VALVE
- PIC PRESSURE INDICATING CONTROLLER
- FIC FLOW INDICATING CONTROLLER
- FI FLOW INDICATOR
- INSTRUMENT AIR LINE

FIGURE 9. WESTGATE PLANT INSTRUMENTATION FLOW SHEET

SECTION IV

CONSTRUCTION

The contract for the conversion of the Westgate Plant was awarded to Air Products and Chemicals, Inc. on February 12, 1971. Construction of the oxygen-activated sludge system at the Westgate Treatment Plant, shown photographically prior to conversion in Figure 10, began in March 1971. In keeping with the County's desires to expedite the project, most of the equipment added in the conversion was prefabricated off-site. On-site construction projects included the following: a) fabrication and installation of two 36.6-m (120-ft) diameter Walker Process Equipment Company steel clarifiers with concrete floors (Figure 11); b) modifications and additions to existing piping including installation of mixed liquor conduits from the basins to the clarifiers, recycle piping and pumps, and sludge wasting equipment; c) installation of the flotation thickeners in a prefabricated steel building (Figure 12); and d) installation of the OASES^{R} equipment including modification of the existing aeration and clarification basin, installation of baffles and covers, and installation of instrumentation.

Installation of the OASES^{R} system was started after the piping modifications around the new clarifiers were nearly complete. Installation involved various additions and modifications to the existing basin shown in Figure 13. The scraper chains were removed and the sprockets relocated, old wooden baffles were removed, and the aeration portion of the basin was modified by removal of the old aeration equipment, including headers, spargers, and compressor connections (Figure 14). Removal of some small segments of the concrete superstructure (Figure 15) was required to accommodate installation of the mechanical aerators and basin covers.

Part of the effluent weirs located in the second clarification section of the existing tanks (Figure 16) had to be modified. The existing weirs had an H configuration in plan view. The weir sections passing laterally across the basin near the end of the covered eighth segments penetrated the gas phase baffle between adjacent oxygenation bays and tanks. To prevent intermixing of gas phases in the various bays and loss of the oxygen rich gas phase through the longitudinal collection channel, these points of penetration in the concrete structure were sealed and the metal edges on the lateral sections of the old effluent weir removed on the upstream leg of the H. Removal of these metal edges effectively lowered the old weir structure below the mixed liquor surface and minimized its influence on aerator throw patterns in the covered eighth segments of the oxygenation bays. The old lateral weirs prior to flooding are shown in Figure 17. The downstream leg of the original H-shaped effluent weir structure, located in the end wall of the basin was left intact with addition of a new metal weir plate.

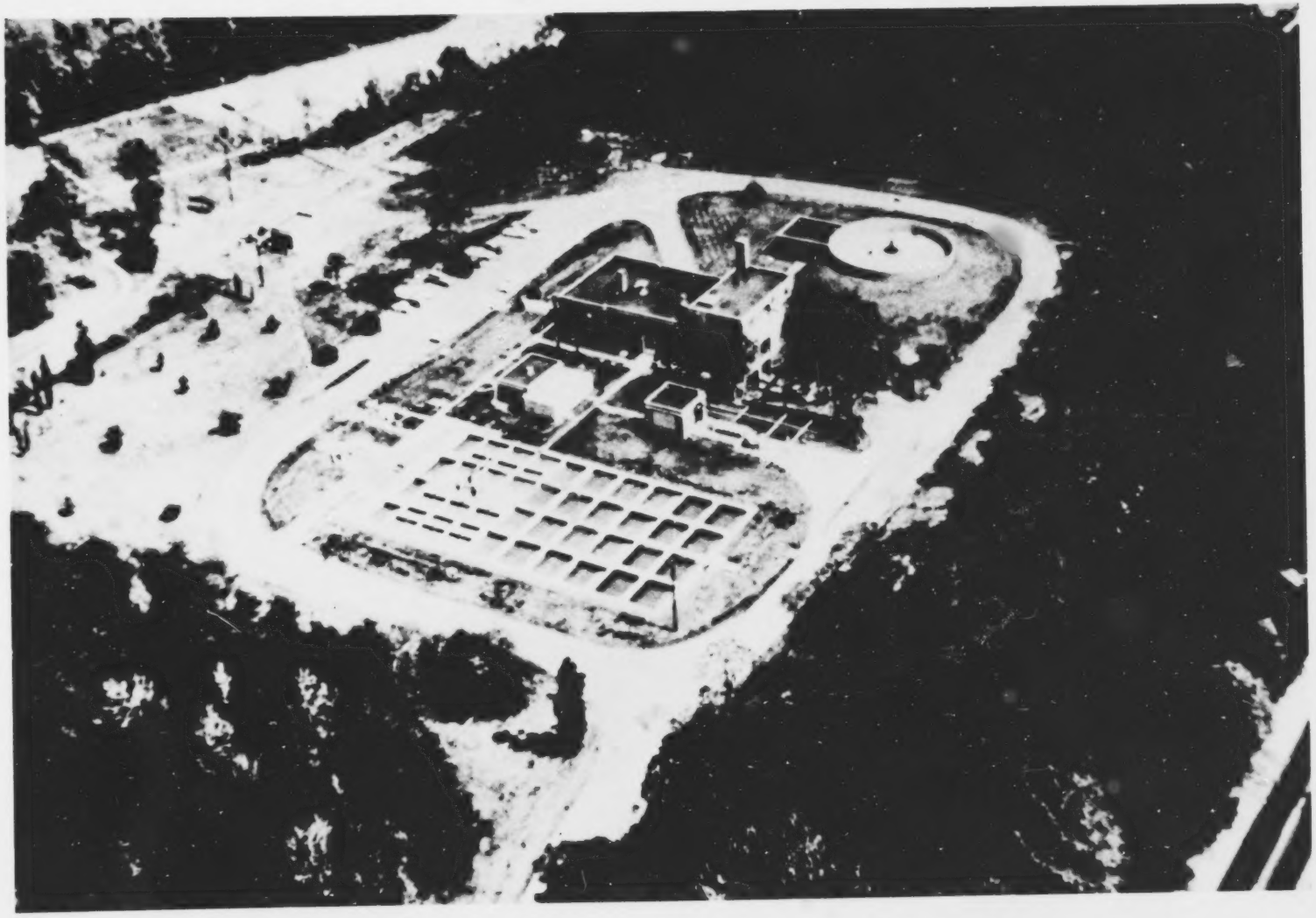


FIGURE 10. AERIAL VIEW PRIOR TO CONVERSION

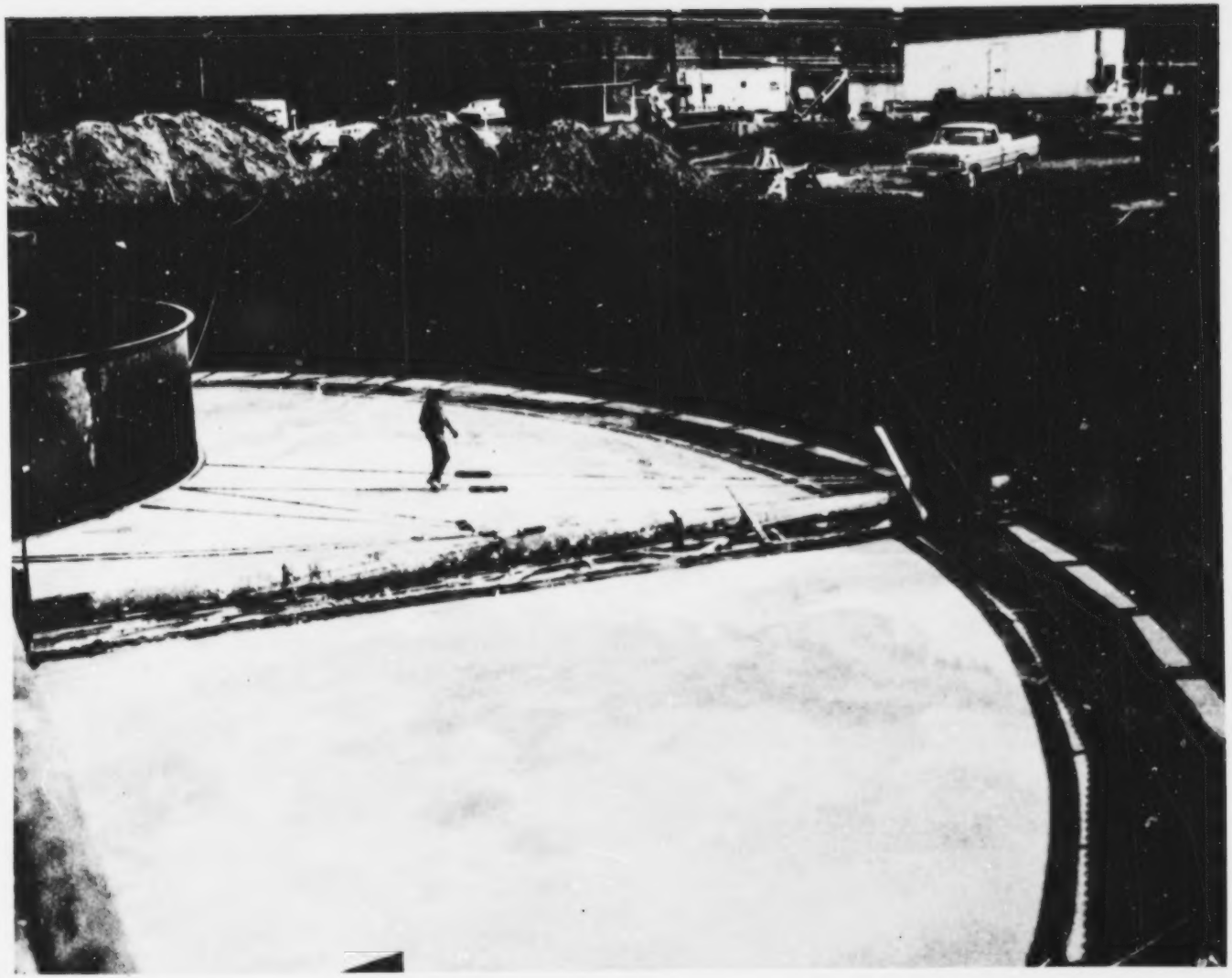


FIGURE 11. INSTALLATION OF SECONDARY CLARIFIERS

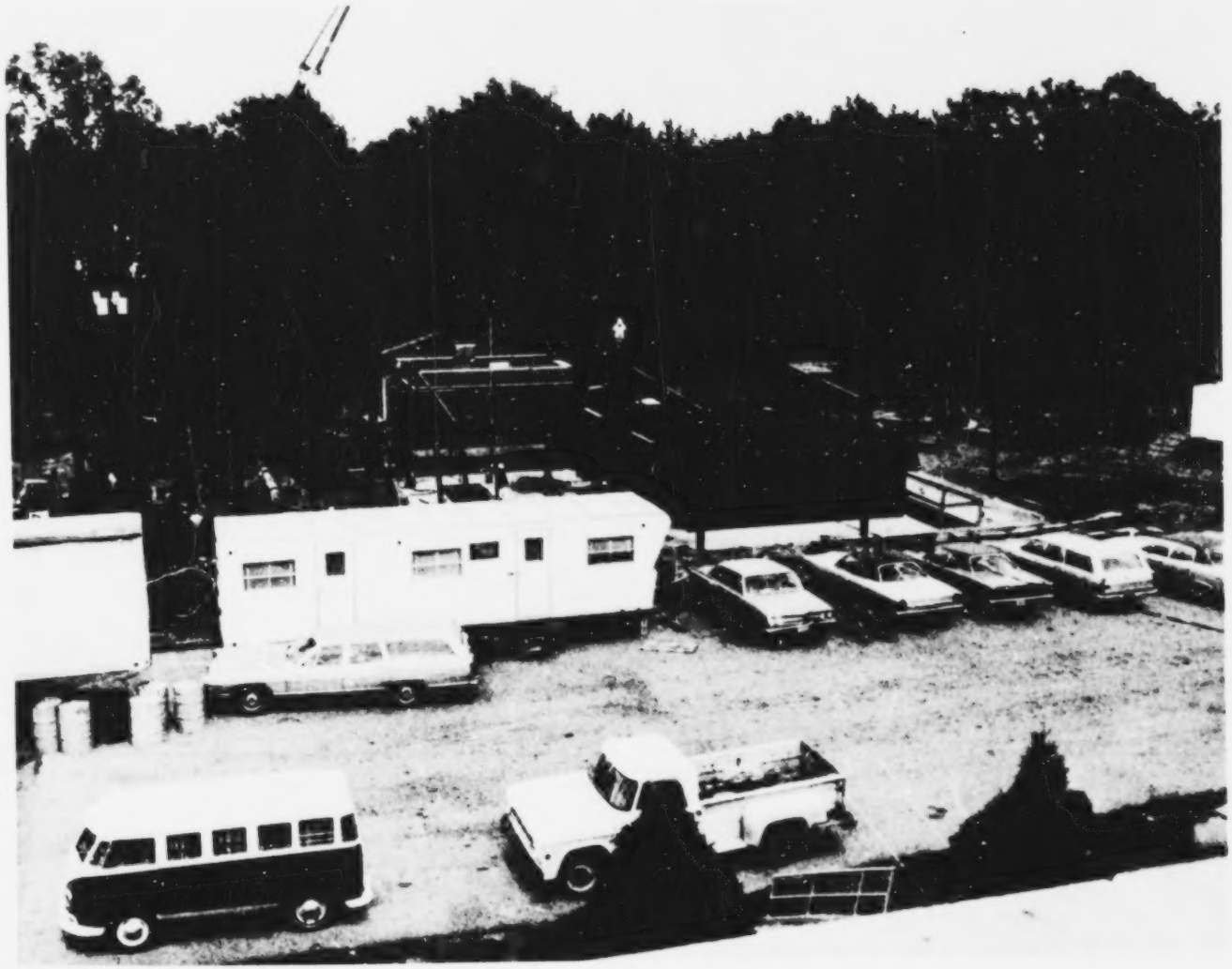
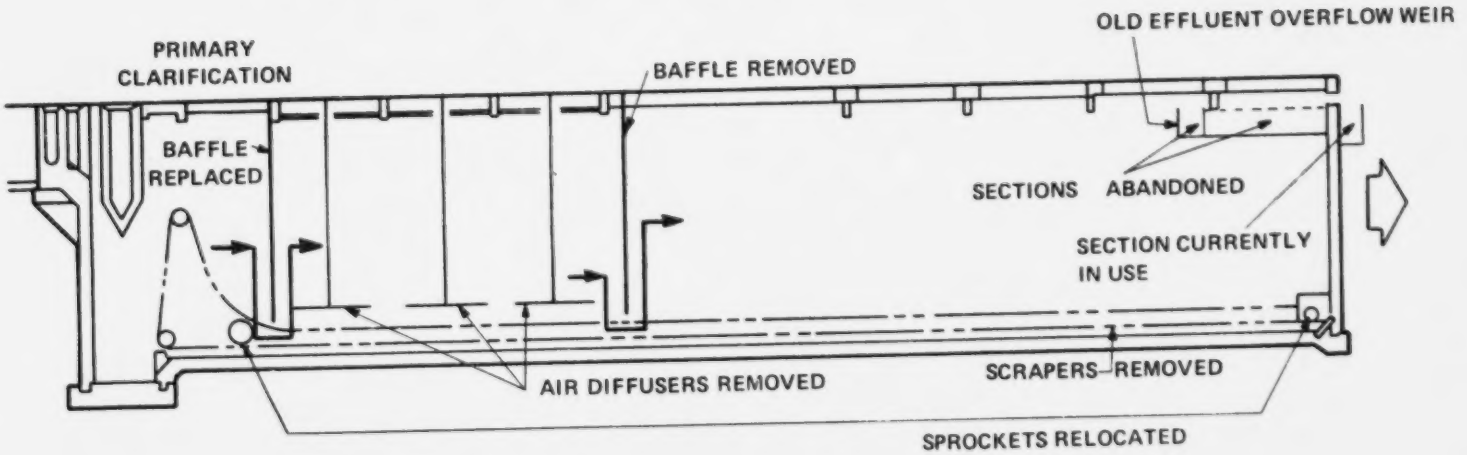


FIGURE 12. INSTALLATION OF FLOATATION THICKENERS



ADAPTED FROM "OPERATIONAL EXPERIENCE AT A COMMERCIAL OXYGEN ACTIVATED SLUDGE PLANT," ROBSON ET AL., PRESENTED AT THE 45TH ANNUAL WPCF CONFERENCE, ATLANTA, GEORGIA.

FIGURE 13. MODIFICATIONS TO EXISTING CONCRETE BASIN – LONGITUDINAL SECTION

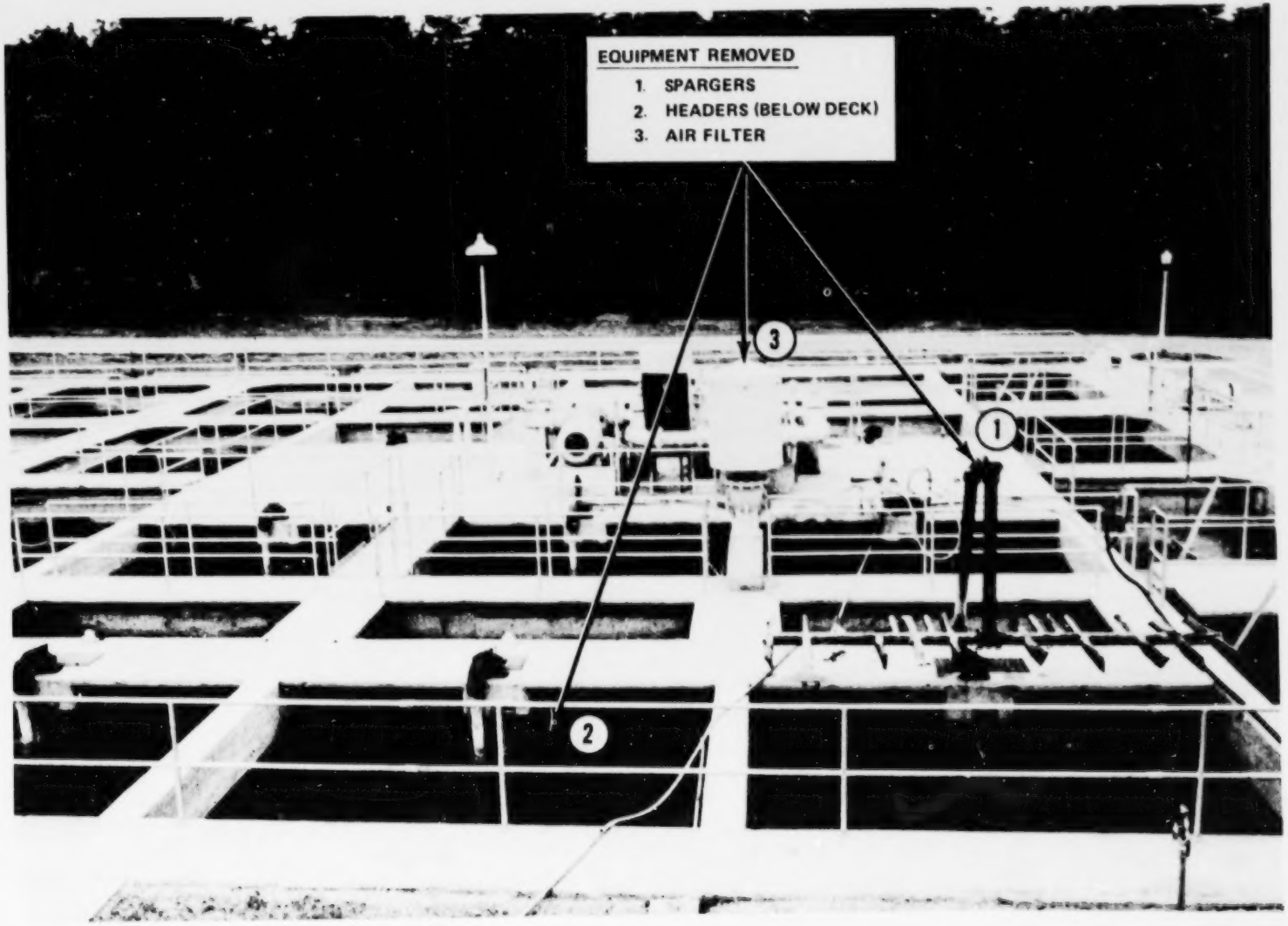


FIGURE 14. EXISTING AERATION EQUIPMENT TO BE REMOVED

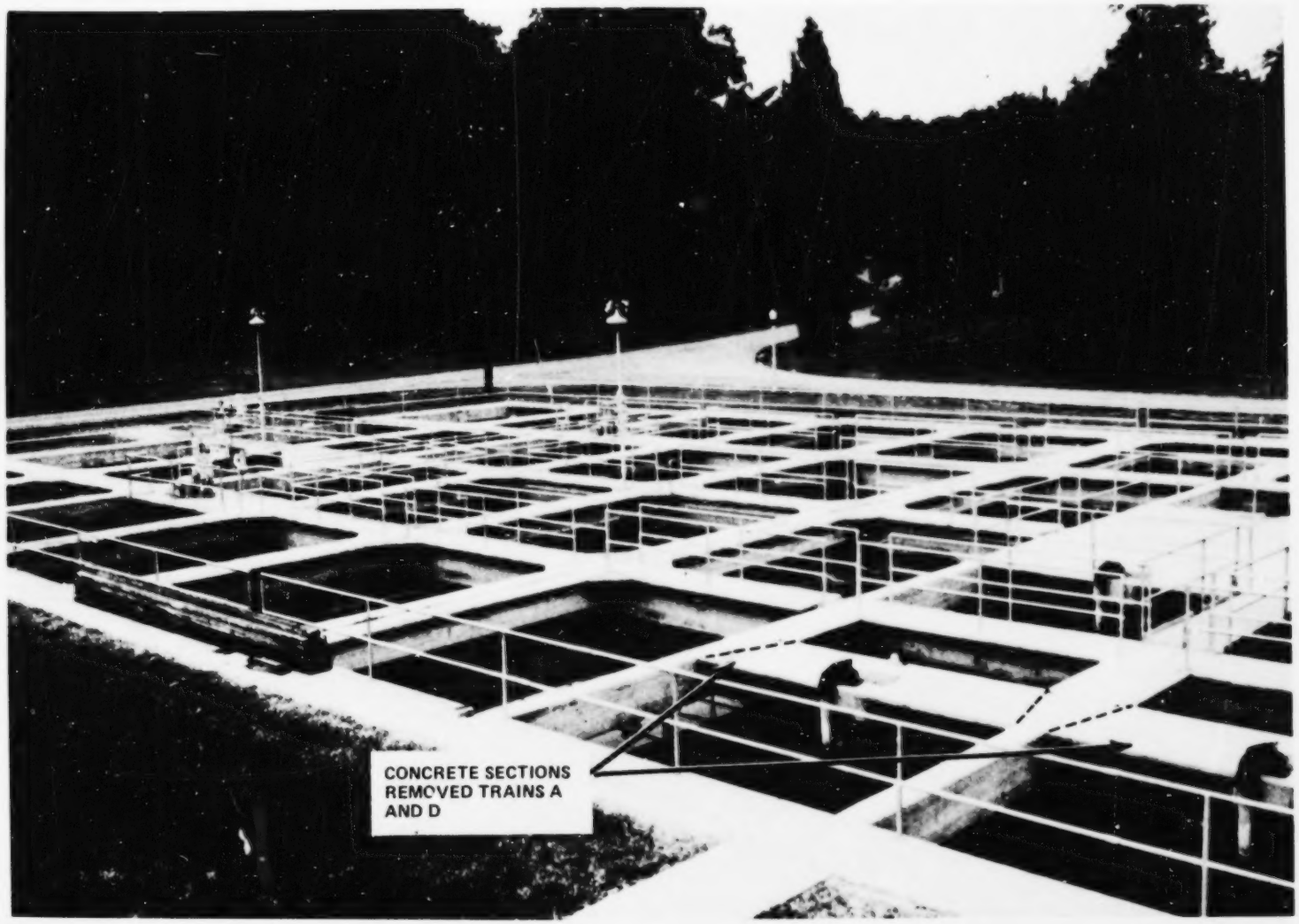


FIGURE 15. CONCRETE SUPERSTRUCTURE MODIFICATIONS

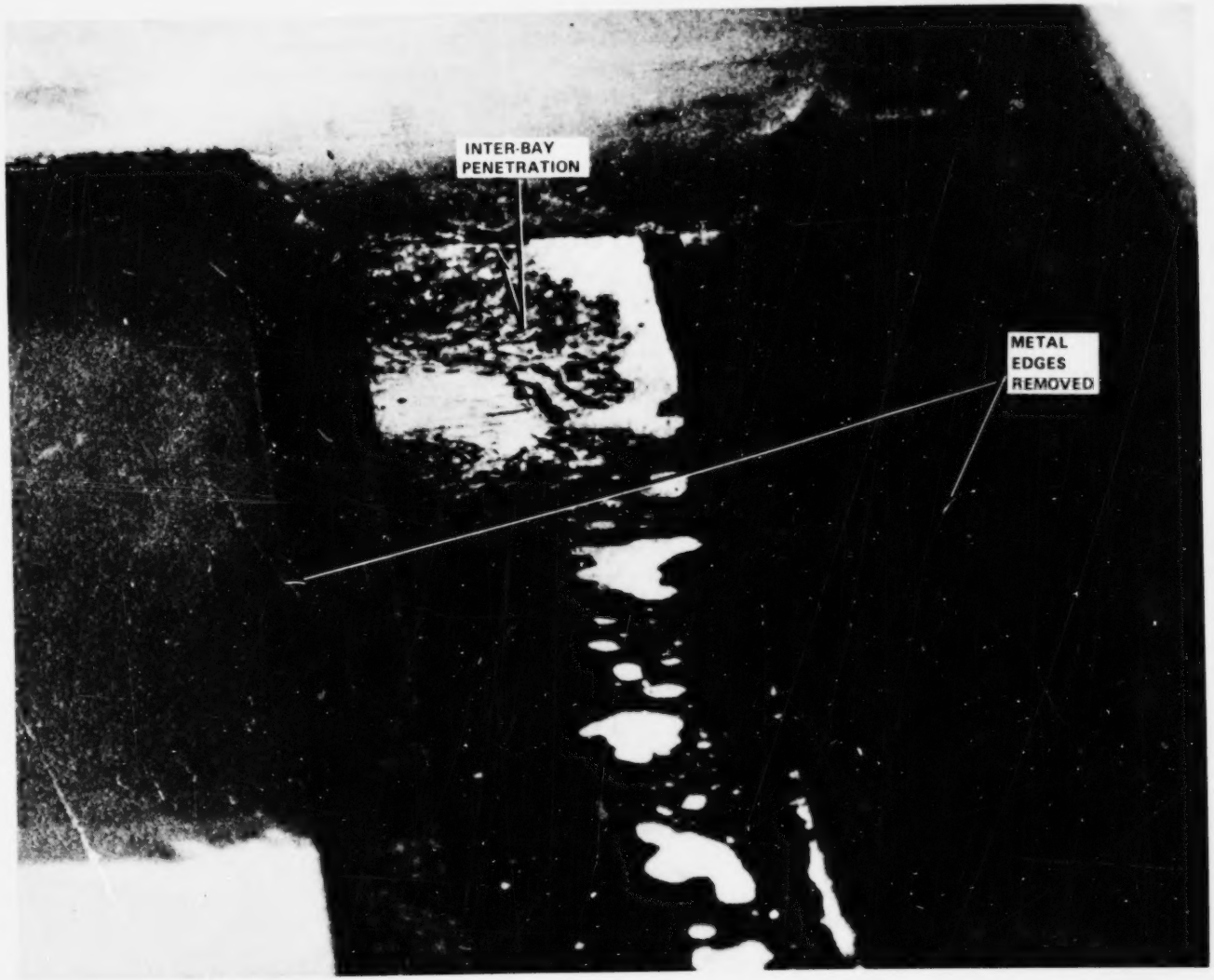


FIGURE 16. PART OF THE ORIGINAL SECONDARY CLARIFIER EFFLUENT WEIRS

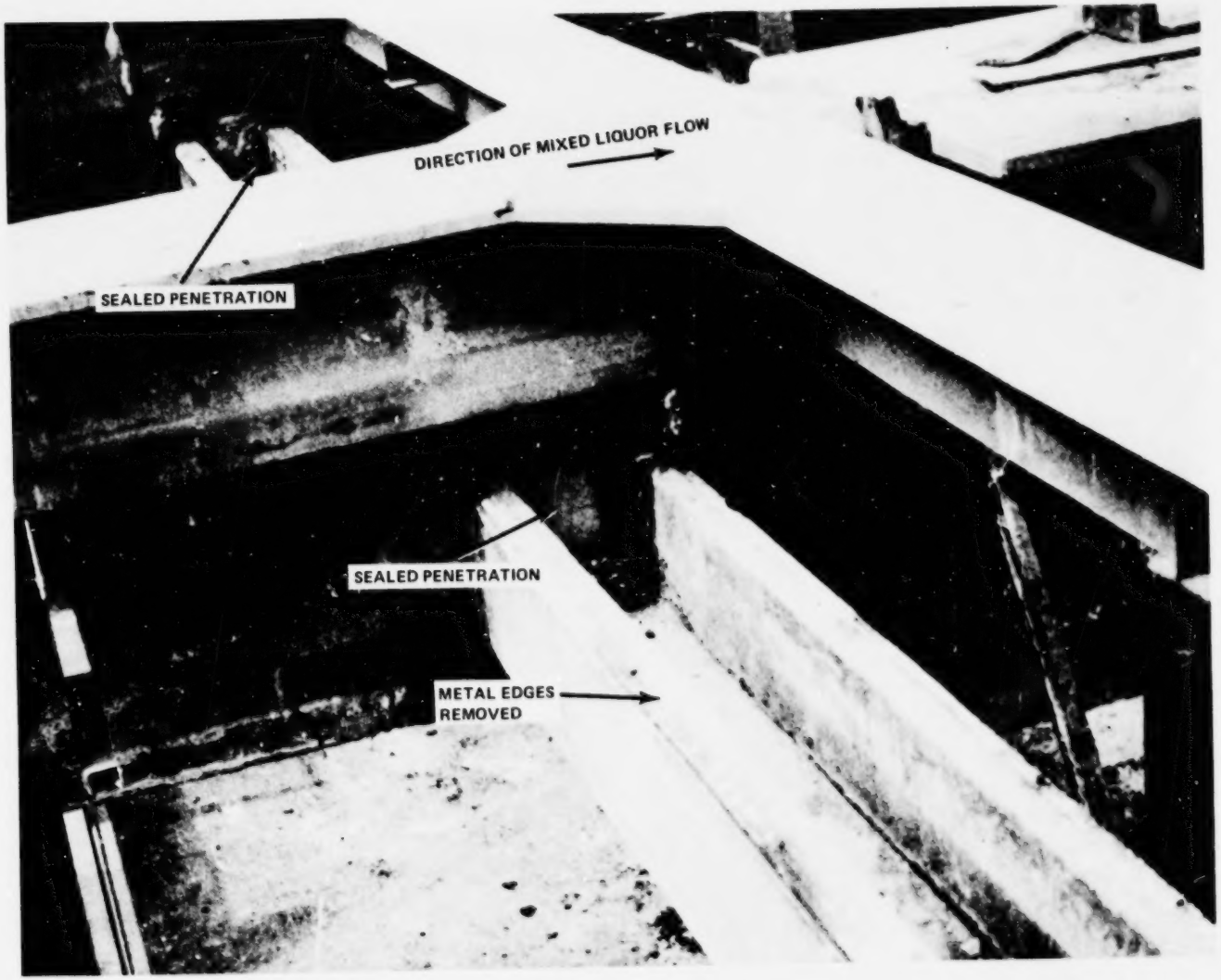


FIGURE 17. MODIFIED EFFLUENT WEIRS PRIOR TO FLOODING

Modifications to the last stage included addition of a quiet baffle in front of the remaining existing overflow weir which is currently used as the exit point for mixed liquor. The quiet baffle is shown in Figure 18.

Liquid baffles of Placite coated carbon steel were installed between the primary sedimentation and activated sludge oxygenation zones and between the four liquid stages of the oxygenation zone. Anti-swirl baffles, also of Placite coated carbon steel, were installed within the zone of influence of each aerator to prevent vortexing about the rotating surface aerator blades. The methods of installation of the liquid and anti-swirl baffles are shown in Figure 19.

The mechanical aerators were installed as integral units with the covers as indicated in Figure 20 for each of the 32 open superstructure segments which received covers. The four aerators installed in the uncovered fourth stage were supported on twin I-beams. One such support is partially visible in Figure 19. Aerators in covered sections of the basin were similarly supported.

The pitch blade surface aerators installed were manufactured by Mixing Equipment Company of Rochester, New York. Two sizes, both employing a hollow quill gearbox (Mixco LAT Series), were used, including eight 7.46-kw (10-hp) units and twenty-eight 3.73-kw (5-hp) units. The eight larger units were installed in the first liquid stage of each train which includes the first two open superstructure segments of each bay. All of the aerators were equipped with up-pumping lower mixing impellers of the axial type. Lower mixing and surface impellers as well as the shafts were Placite coated carbon steel.

Sludge recycle lines were installed at the front of the oxygenation basin as shown in Figure 21. One return line was provided from the recycle pumps to the basin area. The return sludge line branches off at the basin and separate lines then enter each train directly through the basin cover. The electrical switchgear control center installed for the aerators is shown in Figure 22. After installation of the oxygen inlet and vent control equipment shown previously in the flowsheet for Westgate instrumentation (Figure 9), the oxygen supply system (LOX tank and vaporizers), purge blower, instrument air supply, and pressure relief valves were then installed to complete the construction phase. The completed plant including the white cylindrical LOX tank is shown in Figures 23 and 24.

Maintaining some treatment capacity in an existing plant during conversion or modification is frequently required. This was required at Westgate and imposed tight restrictions upon the time permitted for the conversion of each of the aeration tanks. Fortunately, the center longitudinal wall of the existing aeration basin was a structural wall isolating two independent tank systems. This allowed construction to proceed in one basin while treatment of the influent wastewater was continued in the other.

Minimum aeration capacity and minimum mixing levels were maintained in the operating tank using the old air compressor and a special manifold to which hoses were connected and then dropped into the operating tank. Chemical addi-

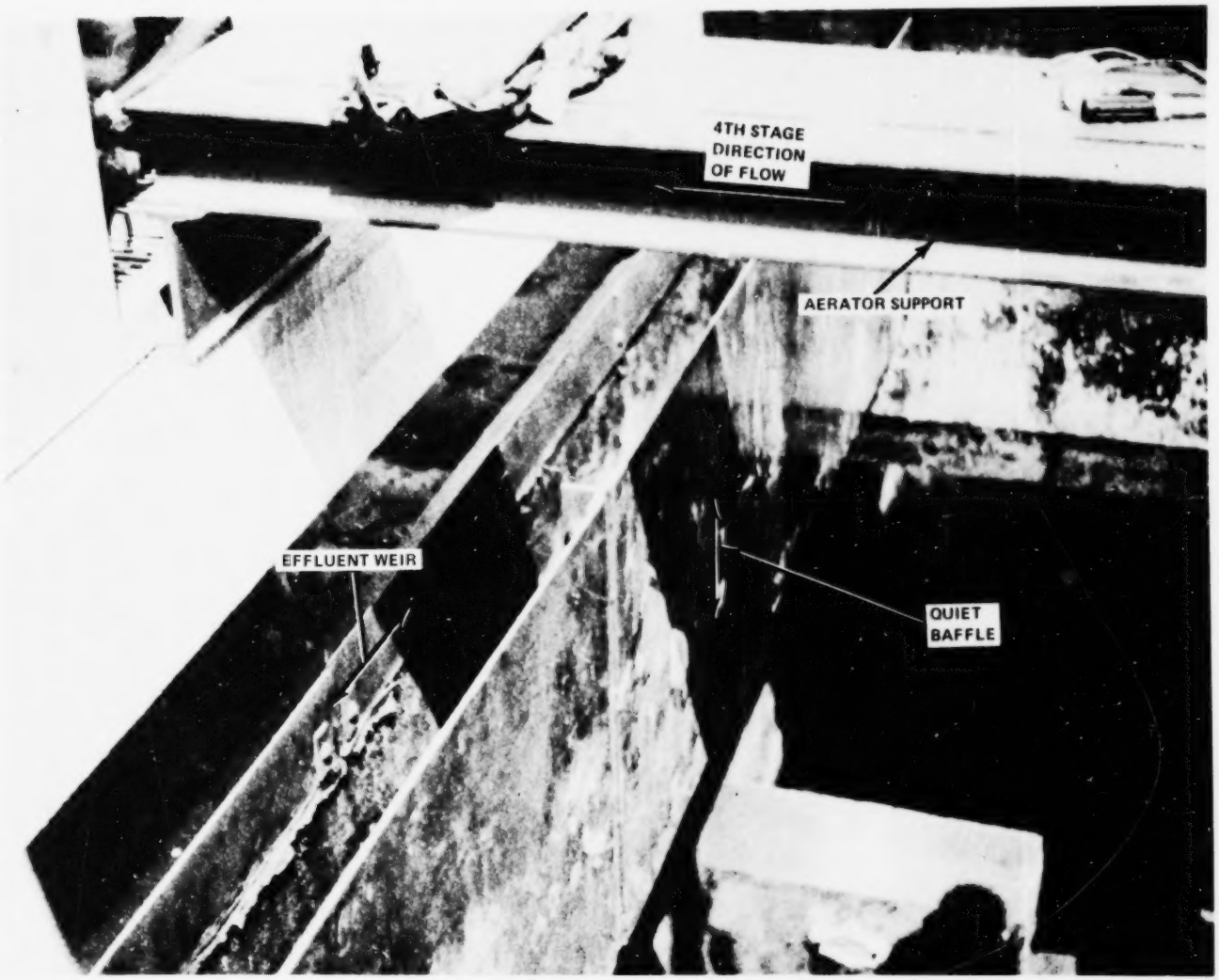


FIGURE 18. QUIET BAFFLE ADDED TO PART OF THE OLD EFFLUENT WEIR

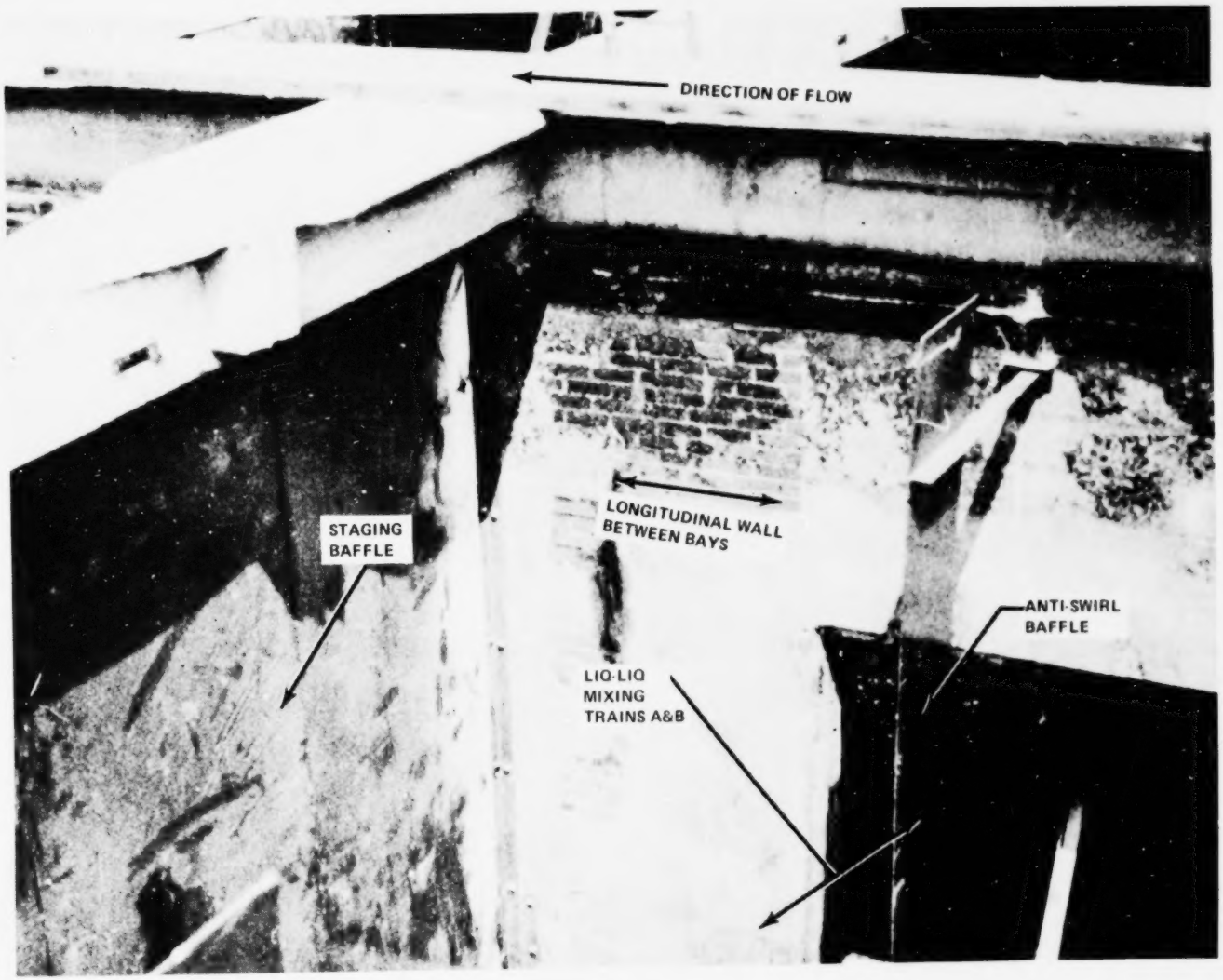


FIGURE 19. LIQUID ANTI-SWIRL AND STAGING BAFFLES AS INSTALLED

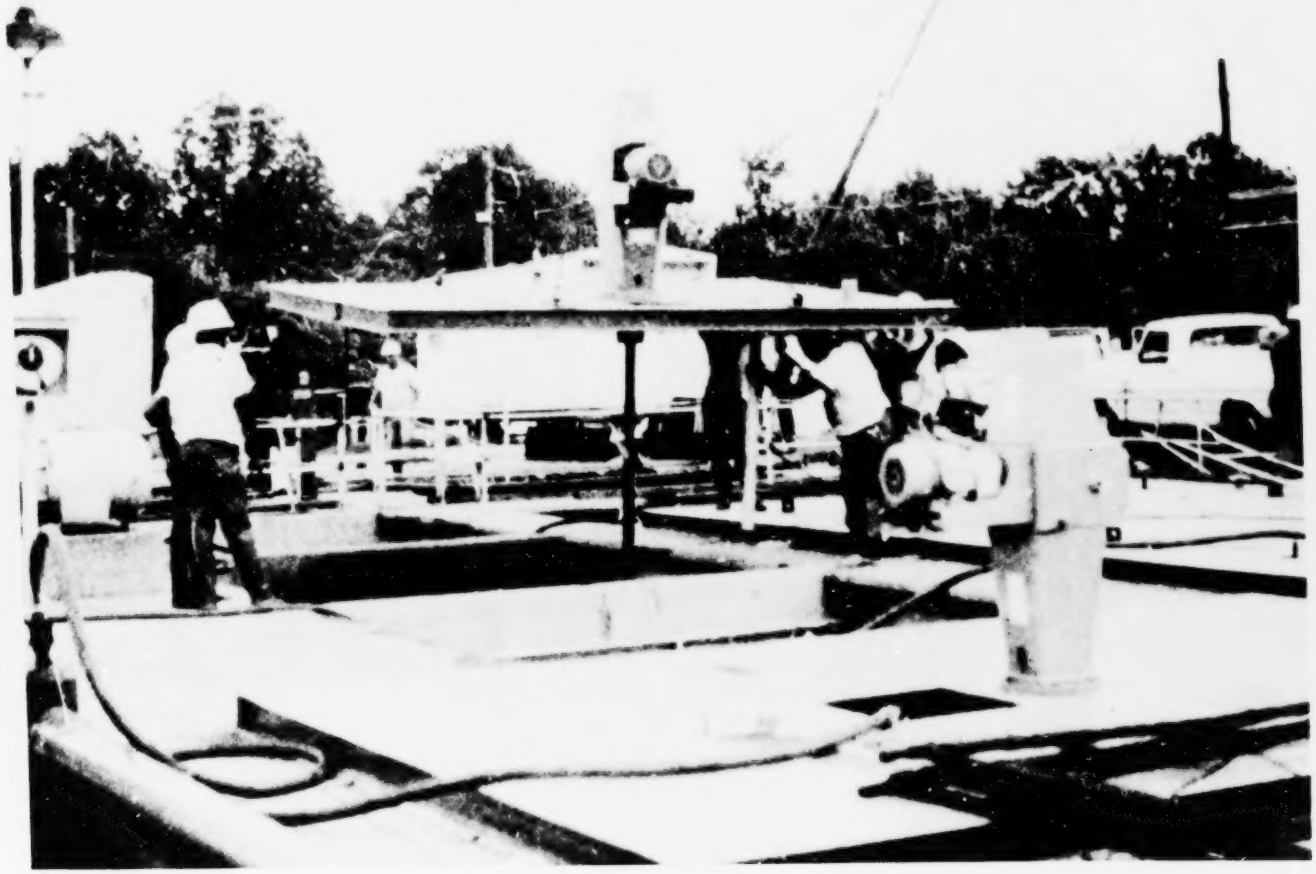


FIGURE 20. INSTALLATION OF AERATOR AND COVER AS A UNIT

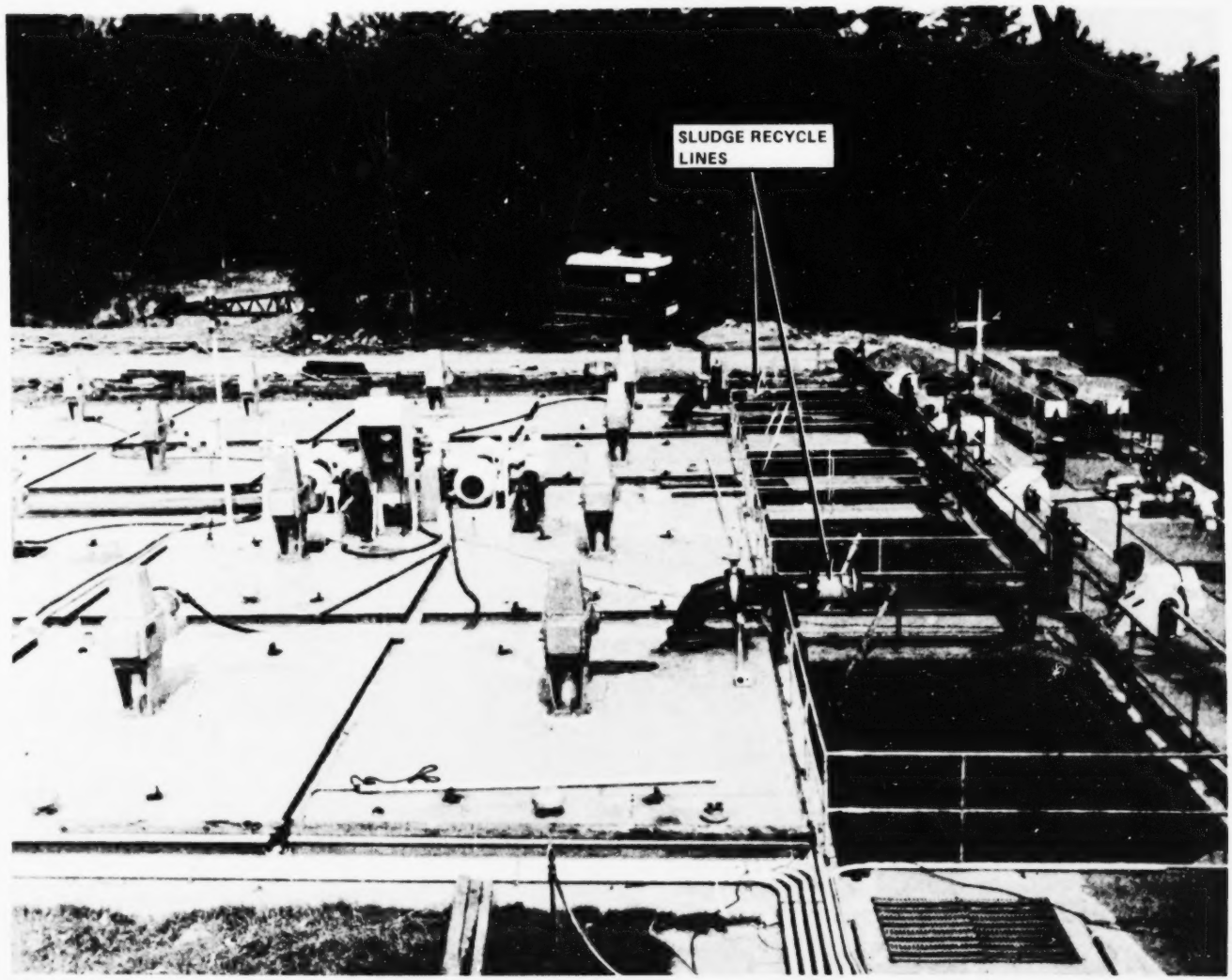


FIGURE 21. SLUDGE RECYCLE LINES AT POINTS OF ENTRY TO THE OXYGENATION BASINS

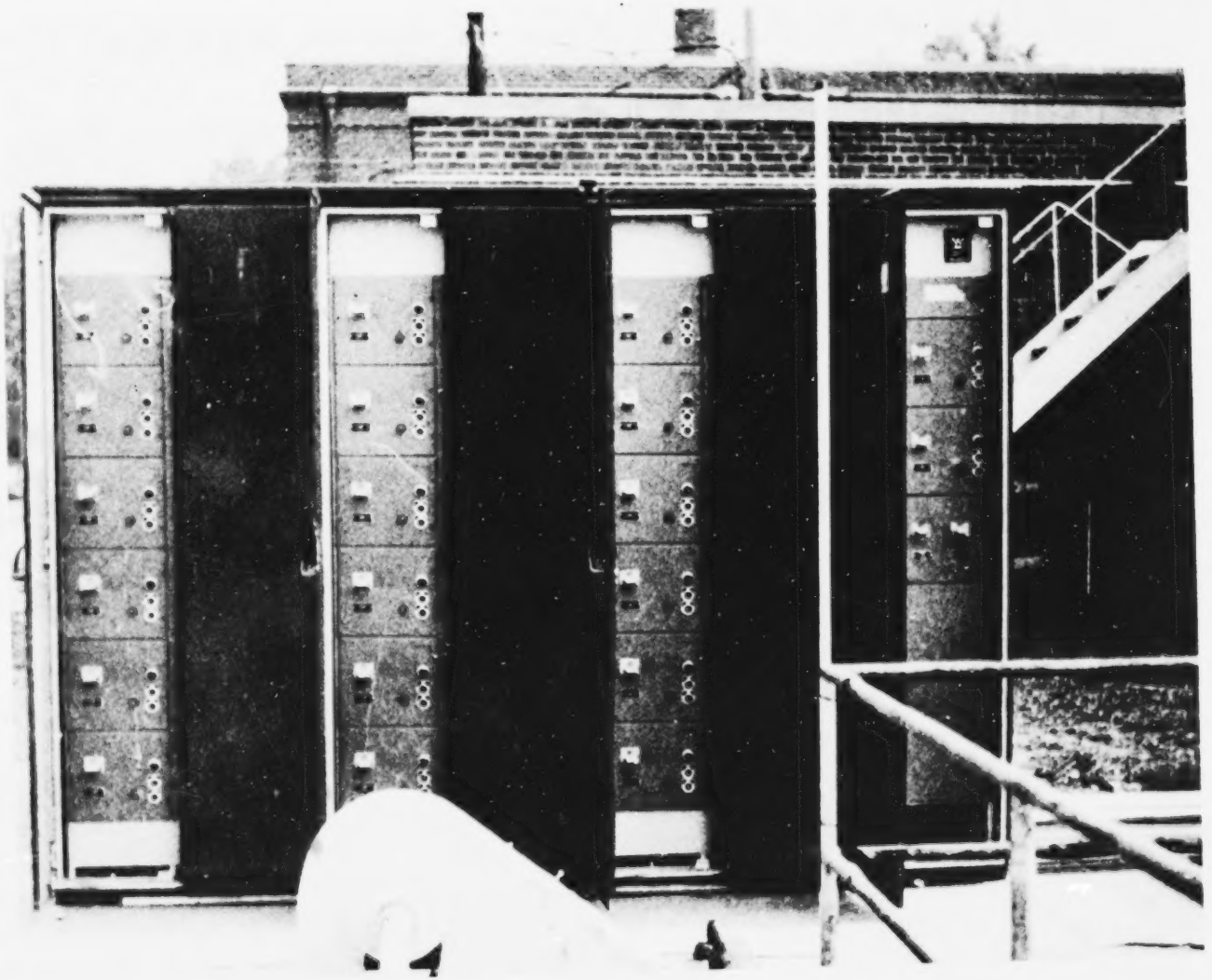


FIGURE 22. AERATOR SWITCH GEAR AND CONTROL CENTER

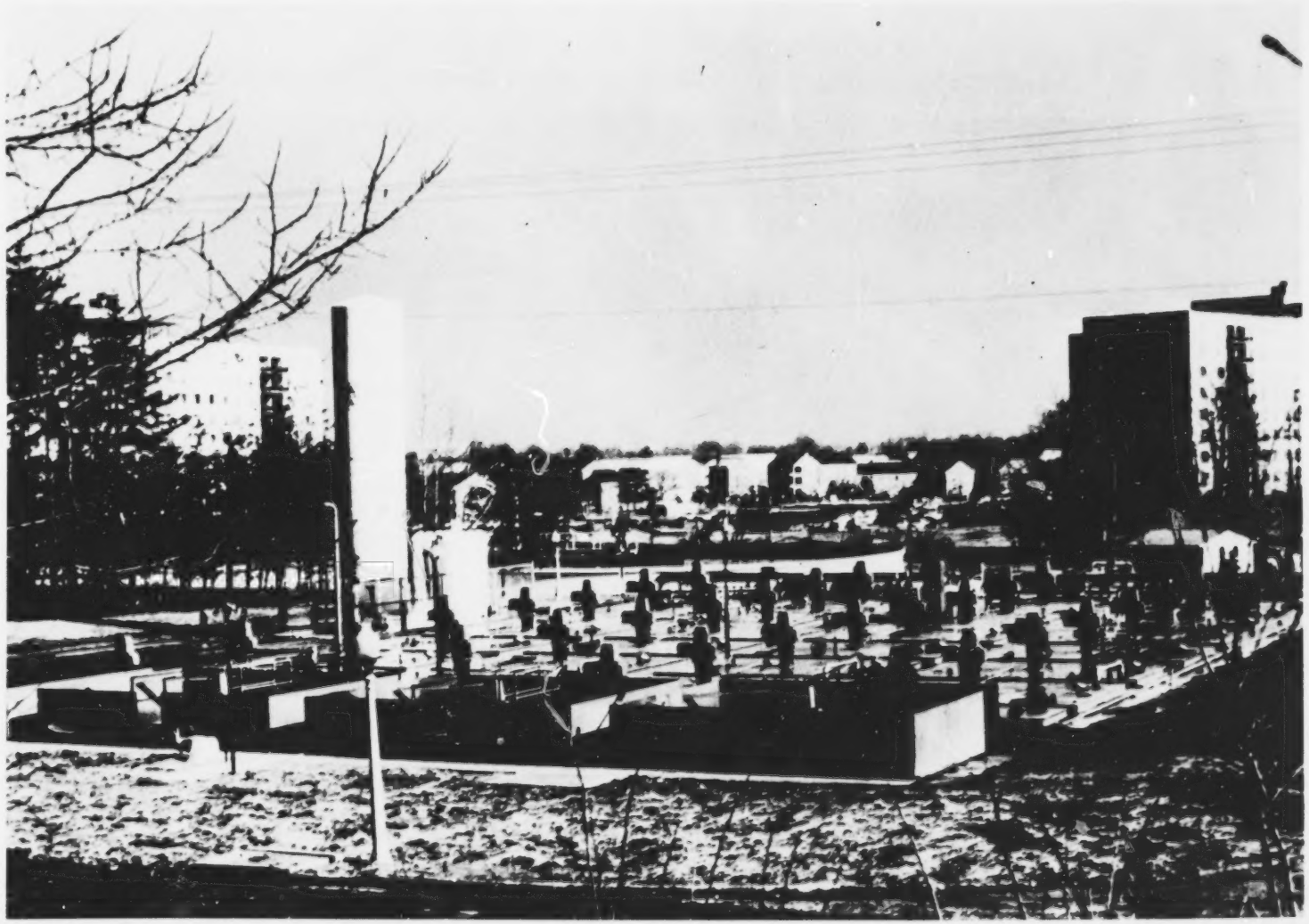


FIGURE 23. COMPLETED INSTALLATION WITH LOX TANK AND VAPORIZERS

FIGURE 24. AERIAL VIEW OF COMPLETED FAIRFAX COUNTY OXYGEN-ACTIVATED SLUDGE PLANT

tion was also continued during the construction phase in order to maintain reasonable treatment efficiency.

To meet the tight deadlines, maximum possible use of prefabricated materials was made for the conversion to the oxygen-activated sludge system. The covers for the 32 oxygenation basin segments were factory prefabricated as were all other metal components including stage and quiet baffles. The covers were shipped to the site and the completed cover assemblies were then swung into place over each of the 32 openings using a crane.

Few significant problems, i.e., delays or accidents, were encountered during the construction phase of the Westgate project. There was some difficulty encountered in relocating the idler sprocket for the old scraper chain from the far end of the basin to the back wall of the primary clarification section. The problem was due to discrepancies between the drawings and the actual construction of the original basins and was quickly solved.

Five days were allowed for modification of each of the aeration tanks because of the need to minimize the period of time that the plant operated under reduced efficiency. This deadline for internal conversion of the aeration tanks was met with some safety margin for both tanks. After completion of the internal tank modifications, the covers were installed while the plant continued to treat wastewater with chemical addition.

Some difficulty was experienced in obtaining a good seal between the steel covers and the existing concrete basin. The basin surface was uneven and tended to be porous to the extent that during early leak tests bubbles could be seen in water puddles over the concrete surface. The concrete also had some cracks on and through the surface (Figure 25). The best method of sealing the covers was found to be a special "cocooning" technique using an oxygen compatible sealant. After surface preparation by sand blasting and priming, the cocoon was sprayed around all edges of the covers and over the surface of the concrete between the covers as shown in Figure 26. This effectively sealed the concrete surface and covers.

Some difficulty was encountered with the installation of one of the secondary clarifiers. When construction of the clarifiers was nearly complete, a heavy rain storm resulted in the flotation of one of the clarifiers, thus delaying its completion beyond the startup date of the oxygen-activated sludge system. Therefore, startup commenced with only one of the two clarifiers operational.

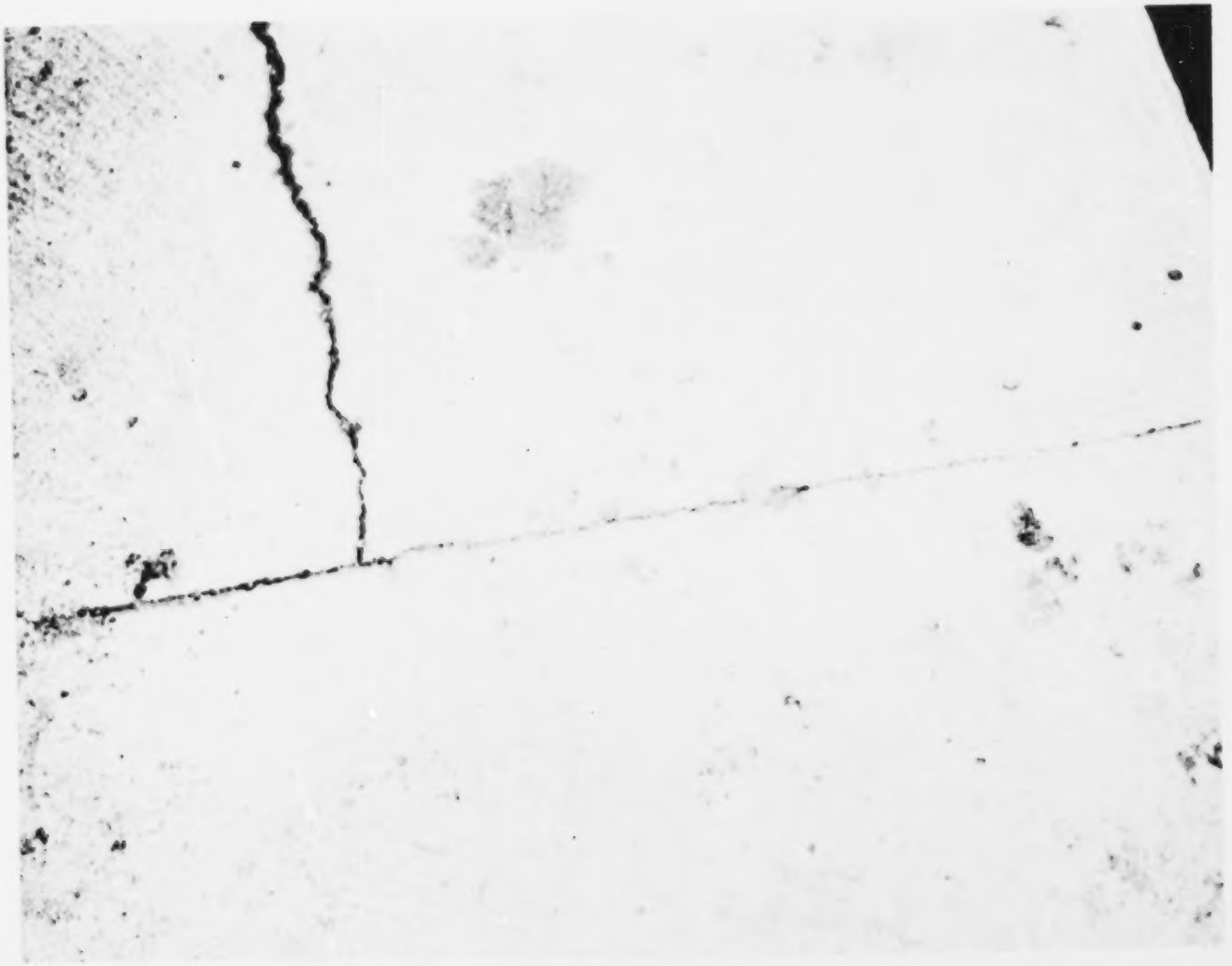


FIGURE 25. SURFACE CRACKS IN THE EXISTING BASINS

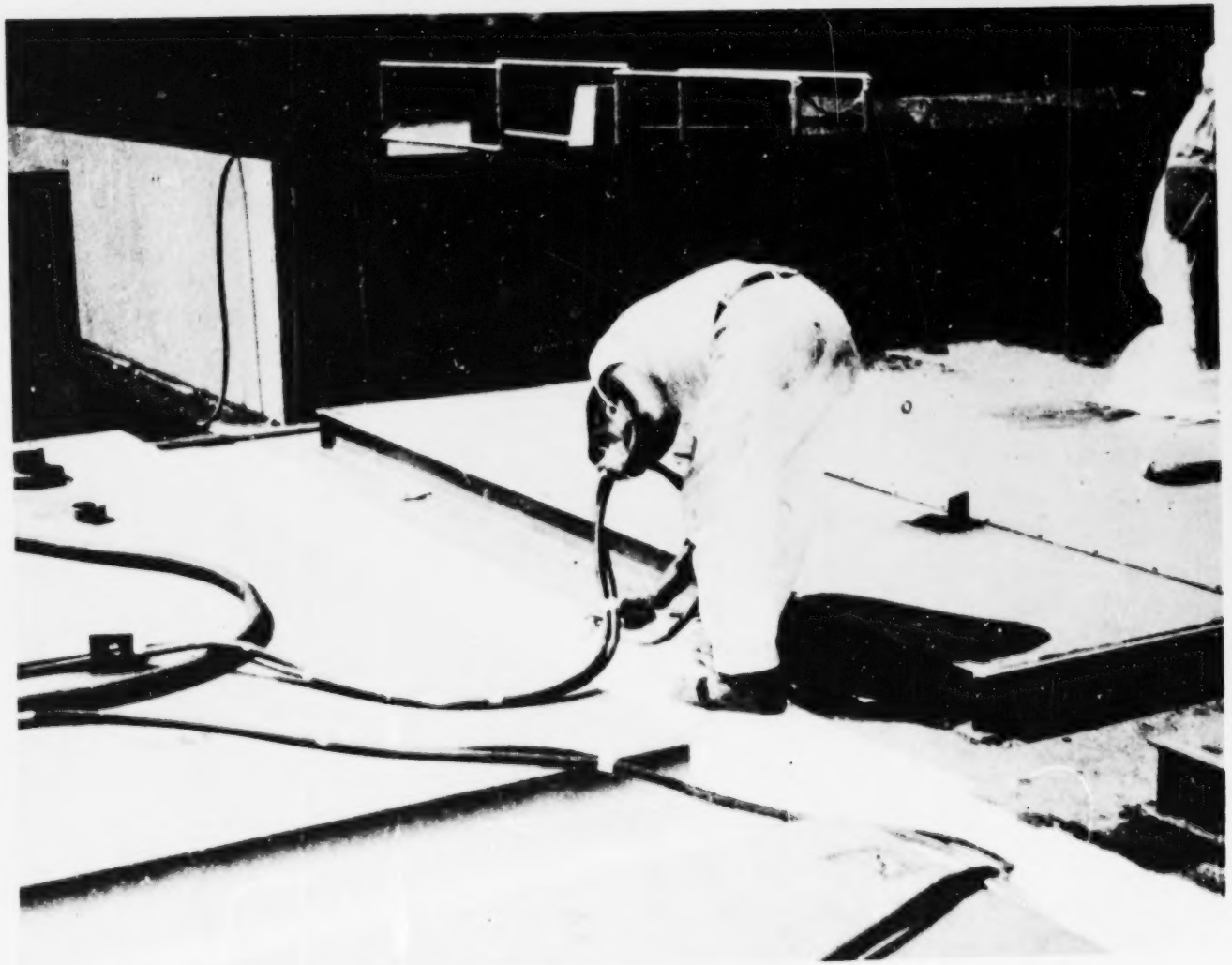


FIGURE 26. APPLICATION OF SPECIAL COCOON MATERIALS TO BASIN COVERS

SECTION VII

STARTUP

Startup operations of the oxygen-activated sludge system at the Westgate treatment plant began early in October 1971. The startup procedure involved equipment checks and process control checks followed by "debugging" activities for both mechanical and process aspects of the plant. On October 16, after the instrumentation was checked out and calibrated, each train was pressurized to 50.8 mm (2 in) of water with air. On October 17, plant startup at full flow was attempted. Chemical treatment had been terminated, and there was very little biomass present in the system at the time. During the tests, it became apparent that some of the 6.4-mm (0.25-in) bolts holding the access plates in the prefabricated covers had sheared causing gas leaks. These were replaced with 9.53-mm (0.375-in) bolts.

Seed sludge was delivered to the plant from Alexandria, Virginia, on October 23-28. In total, the plant received 1716 m^3 (454,000 gal) of sludge providing a mixed liquor suspended solids (MLSS) concentration of between 2,000 and 3,000 mg/l.

During initial operations, the system was operated as an oxygen enriched air process. Oxygen was mixed with air using a proportional air flow controller to maintain a fixed percentage of oxygen in the feed gas to the oxygenation basin. This procedure was discontinued by the County after December 1, 1971, because the simplicity of operating with a pure oxygen feed was more attractive than the potential savings in oxygen costs. Thereafter, only oxygen gas was supplied to the oxygenation basin.

Initially, a few process and mechanical problems were encountered and subsequently solved in order to establish a smooth mode of operation. For example, foaming in the system became a problem on October 21. An anti-foam agent was tested in trains A and B on November 5. A considerable reduction in foaming was observed compared to that in trains C and D. The tendency of the system to foam disappeared in the latter part of November and was eventually attributed to acclimatization of the biomass.

When the second clarifier (see last paragraph of preceding section) was brought on-stream, a problem developed in controlling solids distribution between the two clarifiers. The two underflow lines from the clarifiers had been connected by a common manifold in the recycle pump house. Under these conditions, the two recycle pumps withdrew sludge preferentially from one of the clarifiers, and solids inventory balance between the clarifiers could not be maintained.

In mid-December, a blind flange was installed in the common manifold connecting the two return sludge lines at the recycle pump station. Separate pumping from each clarifier was thus possible, and sludge inventory within the two clarifiers could be controlled. However, the solids control problem within the basins was not solved completely because the recycle pumps were individually too large to handle the low recycle flow rates characteristic of oxygen-activated sludge systems.

In late January 1972, timers were installed for alternating on-off control of each of the recycle pumps. This action stabilized solids levels in the oxygenation basin and sludge blanket depths in the clarifiers.

Another minor problem which developed during startup was the frosting of the liquid oxygen vaporizer. This was due to the fact that the vaporizer was inadequately sized to handle the abnormally high humidity in the area of the Westgate plant. The problem was solved by doubling the surface area of the vaporizer, thus minimizing ice buildup.

After completing plant startup operations, an optimization program was undertaken by Air Products and Chemicals, Inc., beginning on January 24, 1972, and lasting into May 1972. The purpose of this program was to establish a consistent high level of plant performance and to evaluate various other facets of the operations at the Westgate treatment plant. The objective of the first phase of the program was to obtain intensive data which could be used to optimize the performance of the OASES^{R} system.

Oxygen utilization data were obtained. Utilization efficiencies in excess of 90 percent were measured based on oxygen supplied and vent gas composition and flow rates. Bi-hourly measurements of oxygen consumption rates were also obtained and are plotted with a typical BOD_5 diurnal loading pattern in Figure 27. MLSS levels were varied between 3,300 and 6,600 mg/l to determine the optimum operating range. Sludge settling properties, sludge volume index (SVI), and floc characteristics optimized at approximately 3,600 to 3,800 mg/l MLVSS. Data were obtained which indicated a secondary sludge production of approximately 0.33 kg VSS/kg BOD_5 removed (lb/lb) and an overall sludge production (primary plus secondary solids) of 0.76 kg TSS/kg BOD_5 removed (lb/lb). Sludge characteristics, including SVI, zone settling velocity (ZSV) (in a 2.4 m x 0.15 m or 8 ft x 6 in column), and sludge filterability were determined in special tests not detailed herein.

A point of interest that evolved from these studies was the ability of the oxygenated activated sludge to compact with gravity thickening to concentrations sufficient to eliminate the need for flotation thickeners. These data are presented in Figure 28. This characteristic eventually became very useful when the flotation thickeners were taken out of service as a result of odor problems associated with the thickener building. Thus, based on these special test data, the County was able to save on operating costs and eliminate an odor nuisance. Daily values of SVI and ZSV (one-liter test) are plotted in the following section along with other performance data for the entire report period.

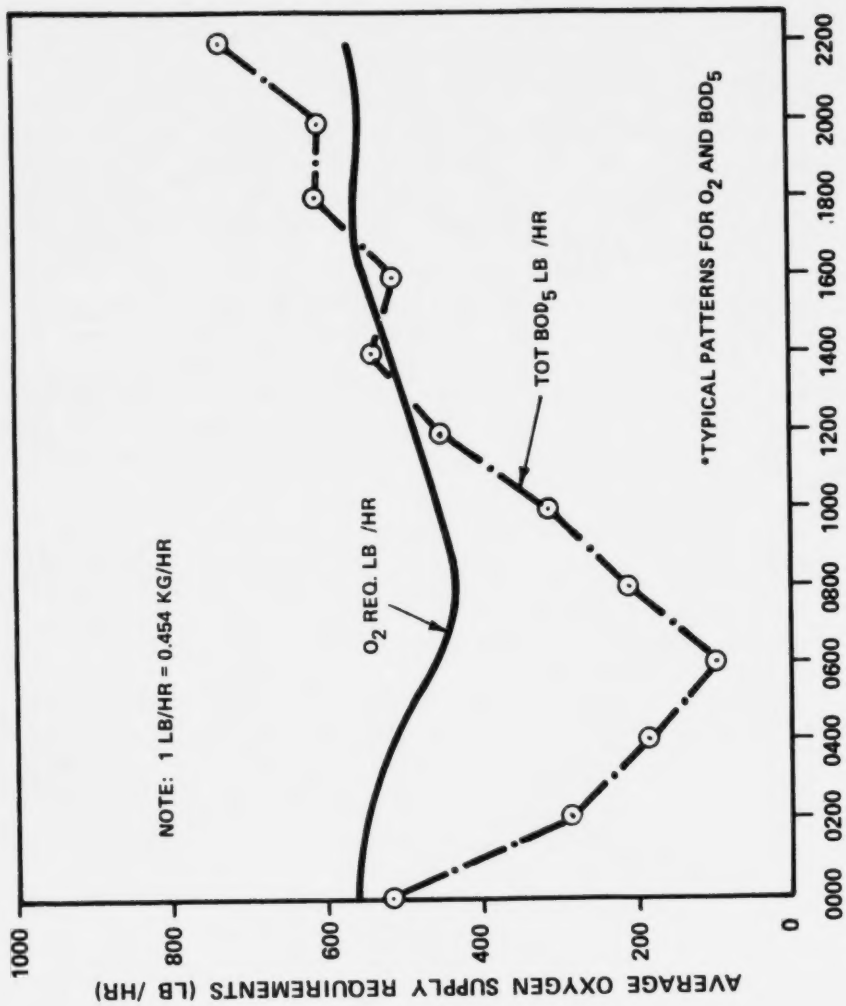


FIGURE 27. FLUCTUATIONS IN OXYGEN DEMAND WITH DIURNAL BOD_5 MASS LOADING *

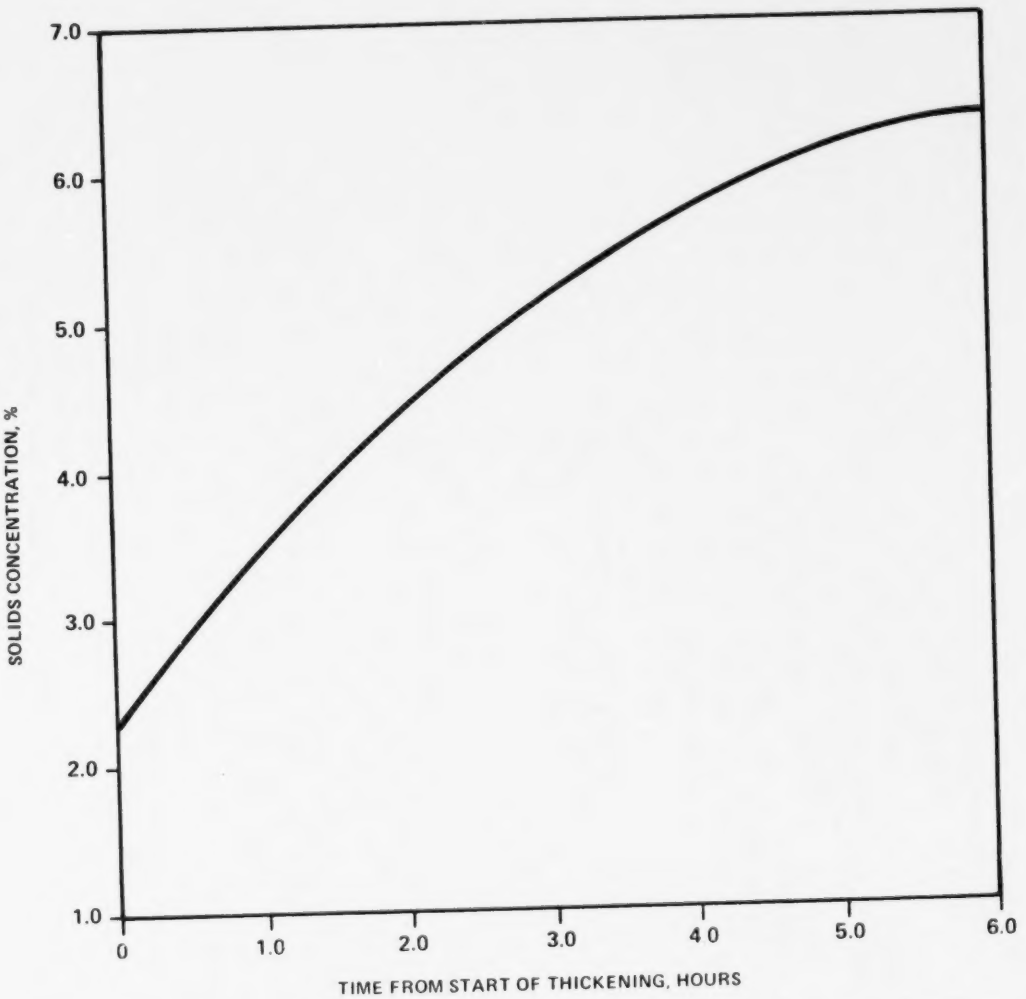


FIGURE 28. GRAVITY THICKENING OF OXYGEN-ACTIVATED SLUDGE

Tests were run to determine the extent of mixing in the oxygenation basin. The mixed liquor concentration profile was found to be uniform except for minor sedimentary pockets in the corners of the stages. On several occasions, the oxygenation tanks were drained,and no serious buildup of solids was found on the bottom. Inspection of the oxygenation tanks while they were drained revealed no serious corrosion of the Placite coated carbon steel covers or aerators. Further studies on corrosion are being conducted at Westgate as part of a larger overall program to study corrosion in oxygen-activated sludge systems. The two-year study is being sponsored by the Environmental Protection Agency and conducted by the Bureau of Reclamation. The first annual report of that project was issued in May 1974 (7).

Secondary clarifier performance was monitored during the optimization program by measuring effluent suspended solids concentration, the clarifier underflow solids concentration, and the distribution of sludge blankets between the two clarifiers. Of particular interest was the underflow solids concentration which ranged from 2 to 3 percent and the low recycle rates thus required. Although these values were expected on the basis of laboratory and pilot plant data, confirmation on a full-scale system was important. Effluent suspended solids, sludge underflow solids, and sludge blanket distribution are presented as a function of time in section VIII of this report.

The oxygen-activated sludge system operations were hampered at times during startup and optimization by mechanical problems in other parts of the Westgate plant. In one instance, because of the temporary breakdown of one of the primary clarifiers,it was necessary to put the entire plant flow through one-half of the oxygenation basin. During the period from 1:30 p.m. on November 25, 1972,through 12:00 noon on November 29, 1972, the oxygen-activated sludge system maintained an average removal efficiency well in excess of that required. Table 5 presents data taken while operating under these conditions for approximately 95 hours.

A breakdown in one of the secondary clarifiers also occurred when a skimmer fell off its mounts to the bottom of the tank. This provided an opportunity to observe plant performance when the full flow of the plant was placed through one of the secondary clarifiers and the average overflow rate exceeded the design rate by about 45 percent. These data are shown in Table 6. Further discussion of these upsets and the response of the oxygen-activated sludge system can be found in the next section.

Chemicals for conditioning mixed primary and secondary waste sludges at Westgate prior to vacuum filtration were not necessary as documented in Table 7. Table 7 indicates that moisture content was approximately the same without chemical addition as with either lime plus ferric chloride and polyelectrolyte addition or with polyelectrolyte addition alone. Filter yield without chemicals was equal to that with lime plus ferric chloride and polyelectrolyte addition and better than with polyelectrolyte addition alone. Lime, ferric chloride,and polyelectrolyte were and still are added prior to filtration, however, to prevent the sludge cake from dewatering during transfer to landfill and to mimimize odors associated with sludge handling. Appendix B further summarizes chemical utilization for sludge dewatering at Westgate.

TABLE 5. DAILY PERFORMANCE WITH PRIMARY CLARIFIER NO. 1 DOWN[a]

Date	Influent Detention Time, hr	Biomass Loading, kg BOD_5/ day·kg MLVSS	MLVSS, mg/l	SVI, ml/g TSS	Final Effluent TSS, mg/l	Final Effluent Tot BOD_5 mg/l	Final Effluent Fil BOD_5 mg/l	% Total BOD_5 Removed
11/18/72	2.77	0.320	3472	73.4	22	12	-	90.2
11/19/72	2.23	0.331	3896	75.7	15	12	3	89.6
11/20/72	2.05	0.532	2755	64.2	8	6	2	95.0
11/21/72	2.20	0.587	2946	69.3	9	9	2	94.1
11/22/72	2.32	0.639	2949	67.8	19	10	2	94.3
11/23/72	2.53	0.590	3611	71.2	16	10	3	95.3
11/24/72	2.46	0.688	3400	69.7	20	15	3	93.5
11/25/72[b]	1.67	0.894	3551	72.4	35	13	4	93.9
11/26/72[b]	1.00	0.968	3480	77.0	28	18	-	86.7
11/27/72[b]	1.24	0.832	3860	58.0	20	16	4	89.9
11/28/72[b]	1.28	0.820	4131	60.3	42	21	6	87.9
11/29/72[b]	1.32	0.736	4306	53.8	39	24	4	78.4
11/30/72	2.32	0.368	4755	60.4	45	25	5	84.6
12/1/72	2.33	0.271	4163	55.9	23	11	-	89.5
12/2/72	2.59	0.316	4428	-	17	10	-	93.1
12/3/72	2.59	0.386	4358	59.6	12	9	3	94.8
12/4/72	2.71	0.354	4361	56.0	14	10	3	94.0
12/5/72	3.00	0.284	4488	60.3	23	9	3	94.1
12/6/72	2.86	0.301	4569	66.1	18	10	3	93.6

(a)Replacement of flight chain sprocket, only one-half of oxygenation basin utilized on dates indicated by (b).
(b)Dates of single primary clarifier and one-half oxygenation basin operation. Primary clarifier and oxygenation basin were taken out of service at 1:30 p.m. 11/25/72 and returned to service on 11/29/72 at 12:00 noon.

TABLE 6. DAILY PERFORMANCE WITH SECONDARY CLARIFIER NO. 2 DOWN[a]

Date	Influent Flow, mgd	Final Effluent Tot BOD_5, mg/l	Final Effluent Fil BOD_5, mg/l	Final Effluent TSS, mg/l	% Total BOD_5 Removed	Average Clarifier Overflow Rate, gpd/ft^2	Average Clarifier Solids Loading, $lb/ft^2 \cdot day$	SVI, ml/g TSS
12/27/72	9.53	7	1	22	93.9	439.2	16.5	62.8
12/28/72	-	5	3	16	96.2	-	-	64.9
12/29/72	9.62	7	-	25	93.6	443.4	17.5	62.9
12/30/72	9.58	8	-	13	94.4	441.5	18.8	61.8
12/31/72	9.84	7	-	4	95.4	453.5	18.6	64.7
1/1/73	9.68	8	2	14	94.1	445.1	19.3	68.5
1/2/73[b]	9.42	49	4	100	67.3	651.1	27.8	67.1
1/3/73[b]	9.55	11	3	11	92.8	880.2	24.8	58.2
1/4/73[b]	9.65	15	2	32	88.6	889.6	13.6	61.2
1/5/73[b]	9.70	12	4	15	91.0	894.2	18.8	63.4
1/6/73[b]	9.60	12	5	16	95.0	663.6	15.6	63.2
1/7/73	9.09	14	3	8	94.4	478.1	12.1	63.7
1/8/73	8.83	14	2	16	94.7	407.0	12.0	69.1
1/9/73	8.57	12	3	14	95.3	395.0	11.6	66.9
1/10/73	8.32	11	3	14	90.9	383.6	10.6	70.6
1/11/73	8.26	11	4	8	93.9	380.7	12.8	67.6
1/12/73	7.96	8	-	7	95.3	366.9	14.0	65.5
1/13/73	7.59	10	-	16	95.0	349.8	13.3	68.3
1/14/73	8.20	9	-	8	94.4	377.9	12.5	66.6

(a)Weld on effluent launders was broken.
(b)Dates of single secondary clarifier operation.

Note: 1 mgd = 0.044 m^3/sec
1 gpd/ft^2 = 0.041 $m^3/day \cdot m^2$
1 $lb/ft^2 \cdot day$ = 4.88 $kg/m^2 \cdot day$

TABLE 7. SLUDGE CONDITIONING AND DEWATERING SUMMARY FOR VARIOUS CHEMICAL PRETREATMENTS

Date	Lime, lb	Ferric Chloride, lb	Polyelectro-lyte, lb*	Filter Yield, lb/ft^2·hr	% Moisture	Dry Sludge, lb
			NORMAL CHEMICAL ADDITION			
10/1/72	1000	1017	51	4.2	75	24,500
10/2/72	1150	339	65	5.8	78	18,480
10/3/72	1250	349	71	2.1	82	12,500
10/4/72	400	593	58	4.8	79	15,960
10/5/72	800	339	43	4.3	79	26,460
10/6/72	1017	700	89	5.8	76	24,160
10/7/72	800	1360	52	5.8	80	22,400
			POLYELECTROLYTE ADDITION ONLY			
12/14/72	0	0	46	3.2	80	19,600
12/15/72	0	0	61	3.1	79	14,700
12/16/72	0	0	73	3.0	80	18,020
12/17/72	0	0	83	2.9	80	16,800
12/18/72	0	0	14	4.6	80	22,400
			NO CHEMICALS ADDED			
12/1/72	0	0	0	3.2	79	17,640
12/24/72	0	0	0	5.6	76	10,800
1/7/73	0	0	0	7.1	79	11,760
5/19/73	0	0	0	3.7	84	20,100

Note: 1 lb = 0.454 kg
1 lb/ft^2·hr = 4.88 kg/m^2·hr

*A cationic polyelectrolyte was used.

In summary, through the optimization program, much was learned about the operation of the Westgate treatment plant in general and about an oxygen-activated sludge wastewater treatment plant specifically. Efficient utilization of oxygen was readily achieved at Westgate. Sludge properties and overall process efficiencies and stability were equivalent or better than anticipated.

SECTION VIII

STABILIZED OPERATIONS

The oxygen-activated sludge system at Westgate, Fairfax County, Virginia has been in operation since late 1971, during which time performance has been excellent. Including the optimization program and startup operations, 104 weeks of data are available for study in this report. All the data in this section have been obtained in Fairfax County laboratories located at the Westgate plant. These labs have been operated by Westgate personnel and without assistance from Air Products and Chemicals, Inc.

The Westgate plant influent is generally classified as a domestic wastewater. Characteristics of the raw influent wastewater are presented in Figures 29 through 35. Note that raw influent characteristics are used throughout the report even though there are small primary clarifiers in the system. It was extremely difficult to get a representative sample of the primary effluent which passes directly into the oxygenation basin through submerged openings. Plant personnel normally obtain samples from the raw influent channel; hence, daily primary effluent characteristics are not available. A comparison of raw influent and primary effluent characteristics was made with difficulty during startup operations. It showed little difference in the characteristics of these streams. Comments and data on this comparison can be found in Section IX.

Weekly average values for various influent characteristics are plotted in Figures 29 through 35 for each of the 104 weekly periods of operation from October 1971 through September 1973. Some data, including total BOD_5, total COD, and TSS concentrations are presented in probability of occurrence plots to further help characterize plant influent (Figures 36 and 37). The influent flow rate is presented in a similar manner in Figure 38 with probability of occurrence plots for daily minimum, average, and peak flows.

The data presented in the above figures indicate the moderate strength and the nature of the wastewater received at Westgate. Variation in flow rate to the plant is somewhat limited by the fact that the influent is pumped to the plant. However, there is still a significant variation in flow to the plant over a 24-hour period. This is clearly shown in Figure 38 where maximum and minimum values have a 50 percent probability of being equal to or less than 0.55 m^3/sec (12.6 mgd) and 0.29 m^3/sec (6.6 mgd), respectively.

Influent total BOD_5, total COD, and TSS weekly average values as plotted reflect a reasonable consistency in the influent strength over the entire operating period. The COD is somewhat more erratic than the BOD_5 as might be expected because of the greater sensitivity of COD values to influent solids.

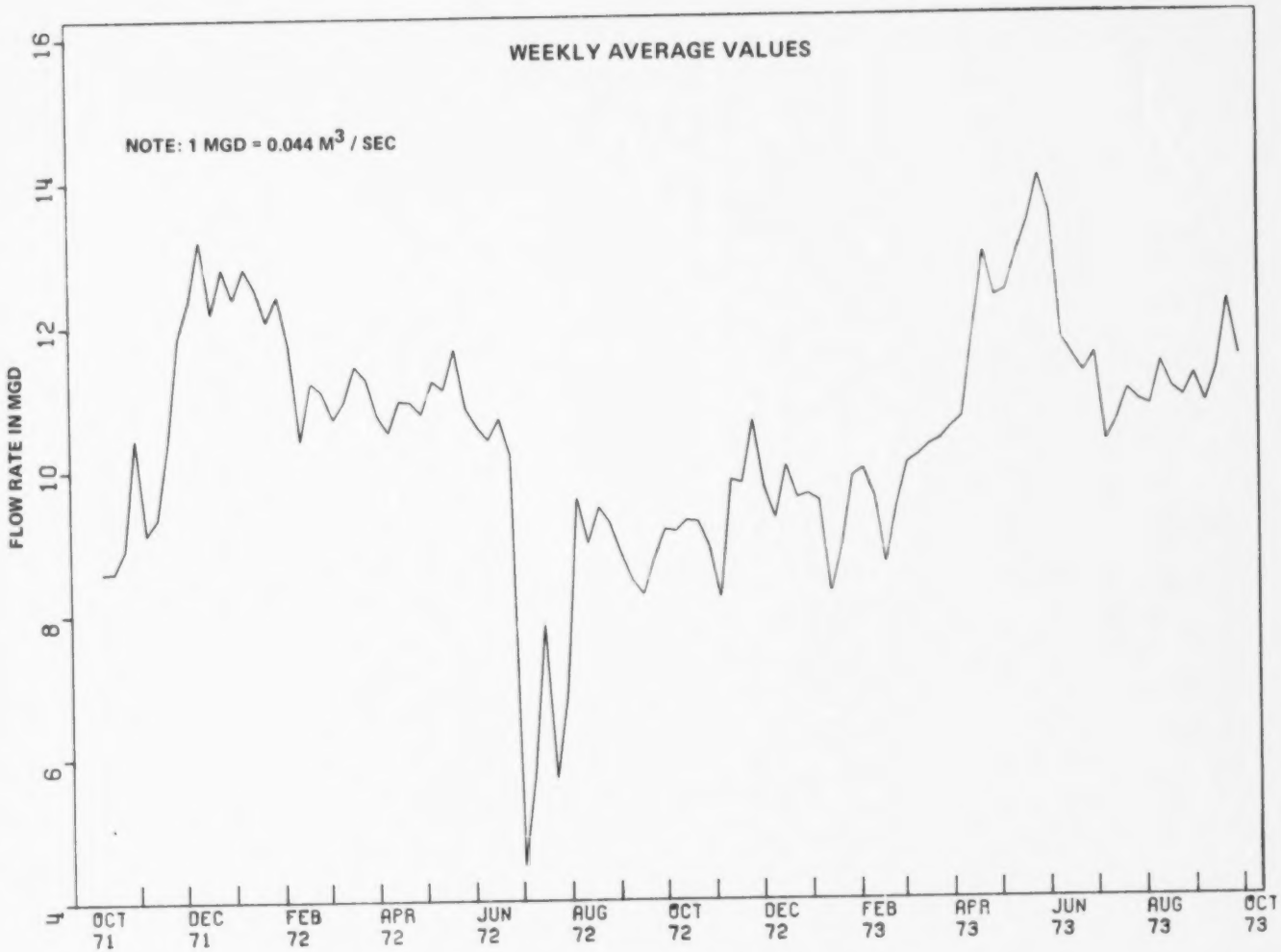


FIGURE 29. DAILY INFLUENT FLOW RATE

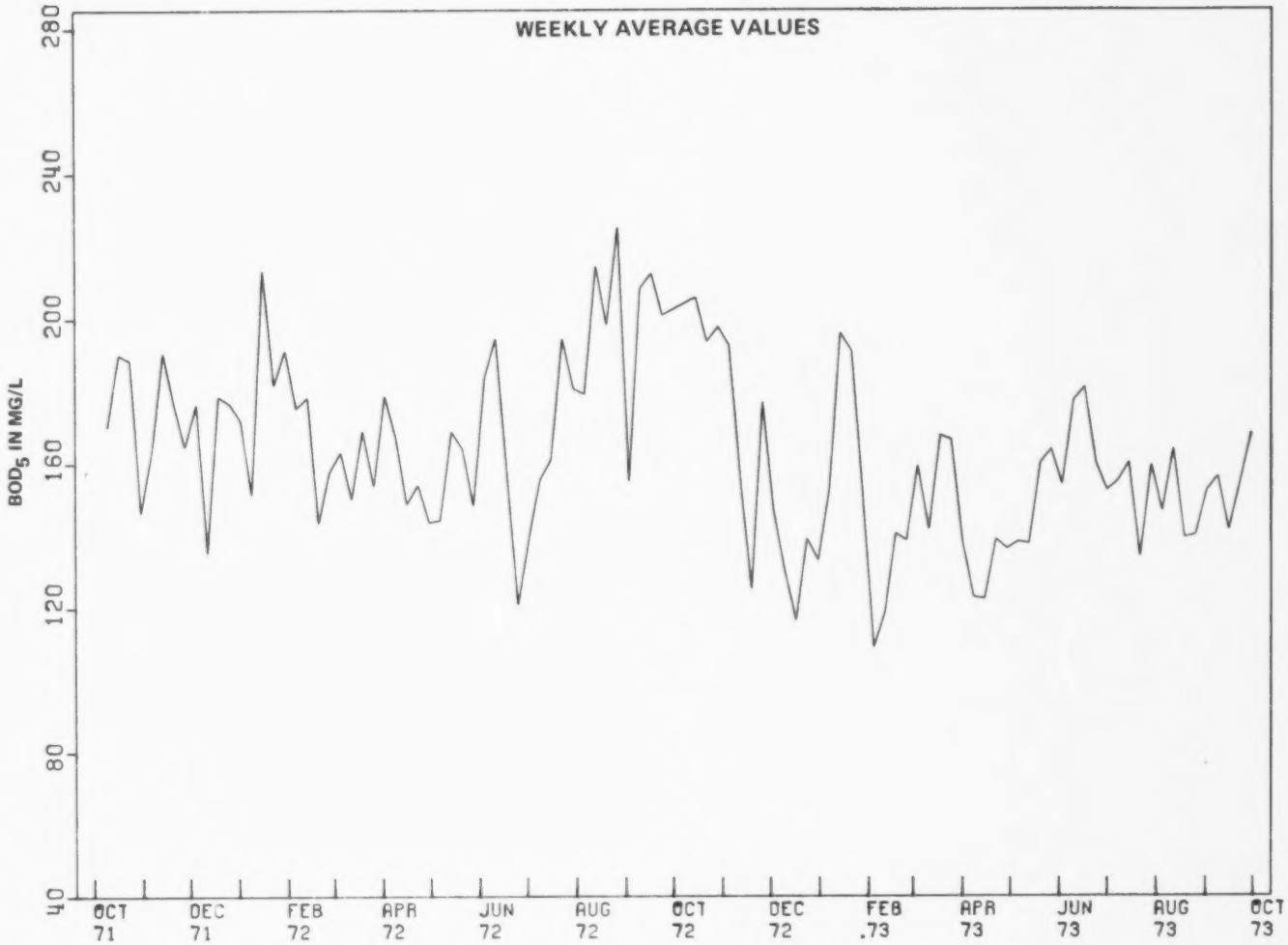


FIGURE 30. INFLUENT BOD_5

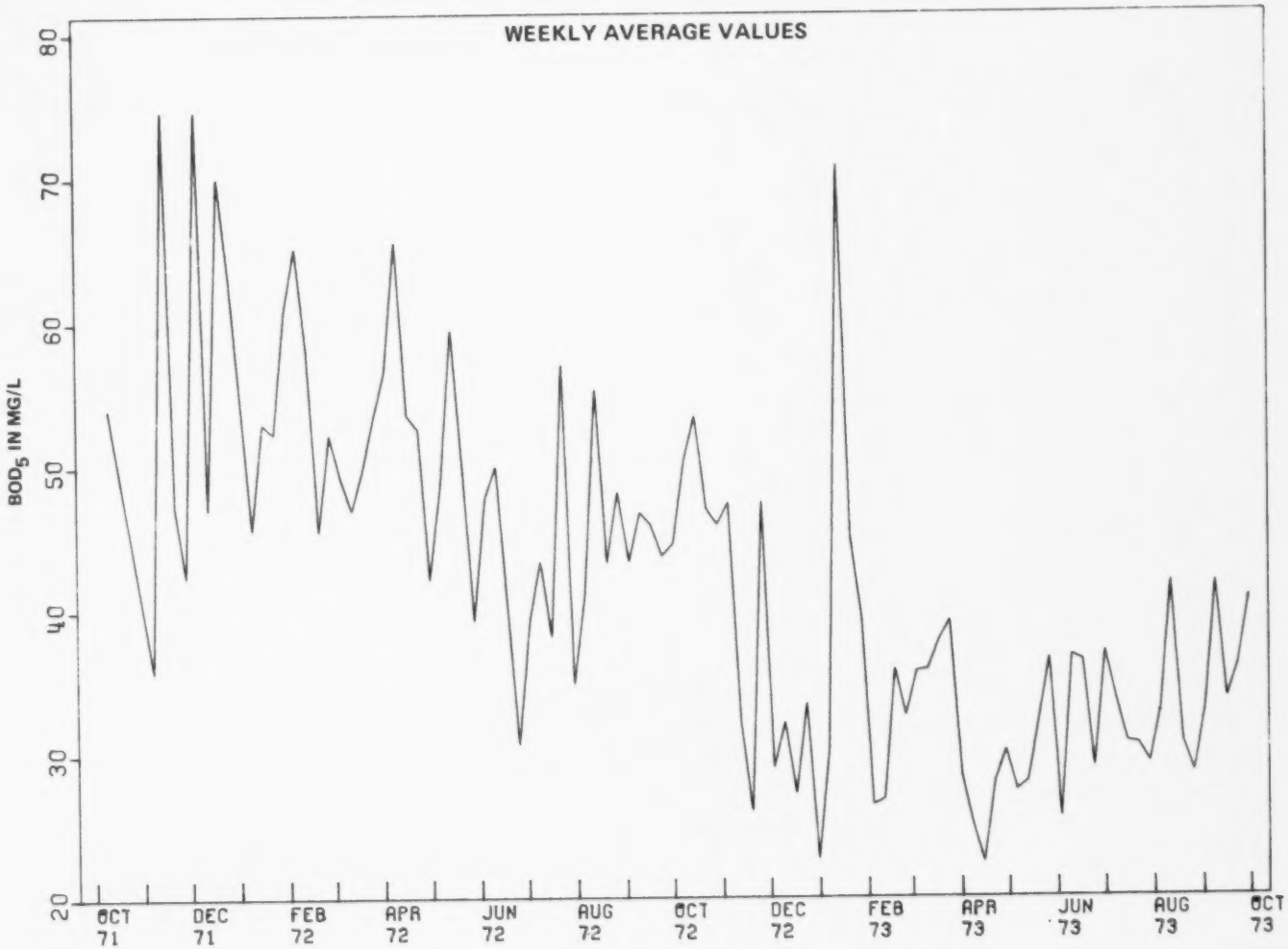


FIGURE 31. INFLUENT SOLUBLE BOD_5

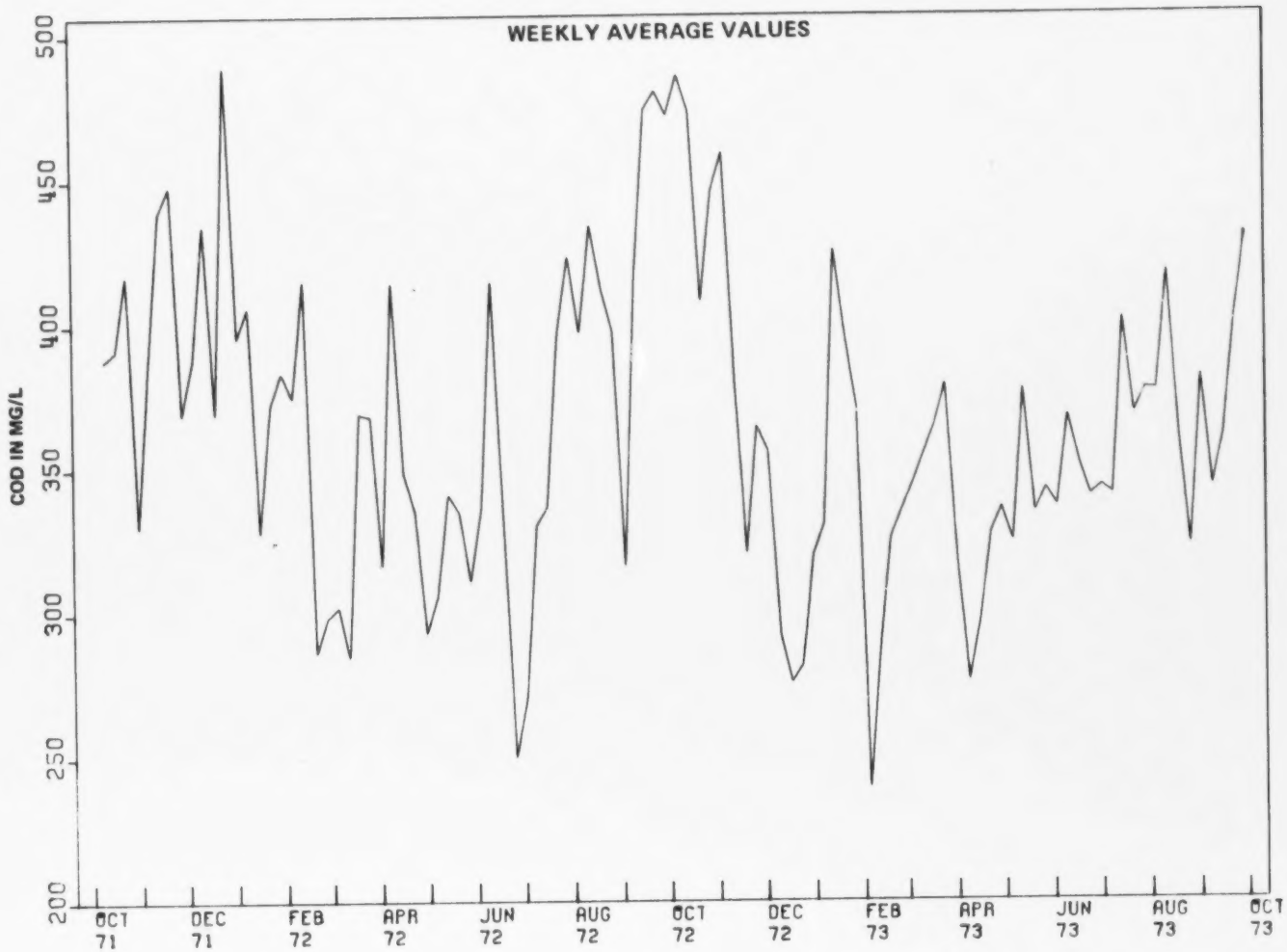


FIGURE 32. INFLUENT COD

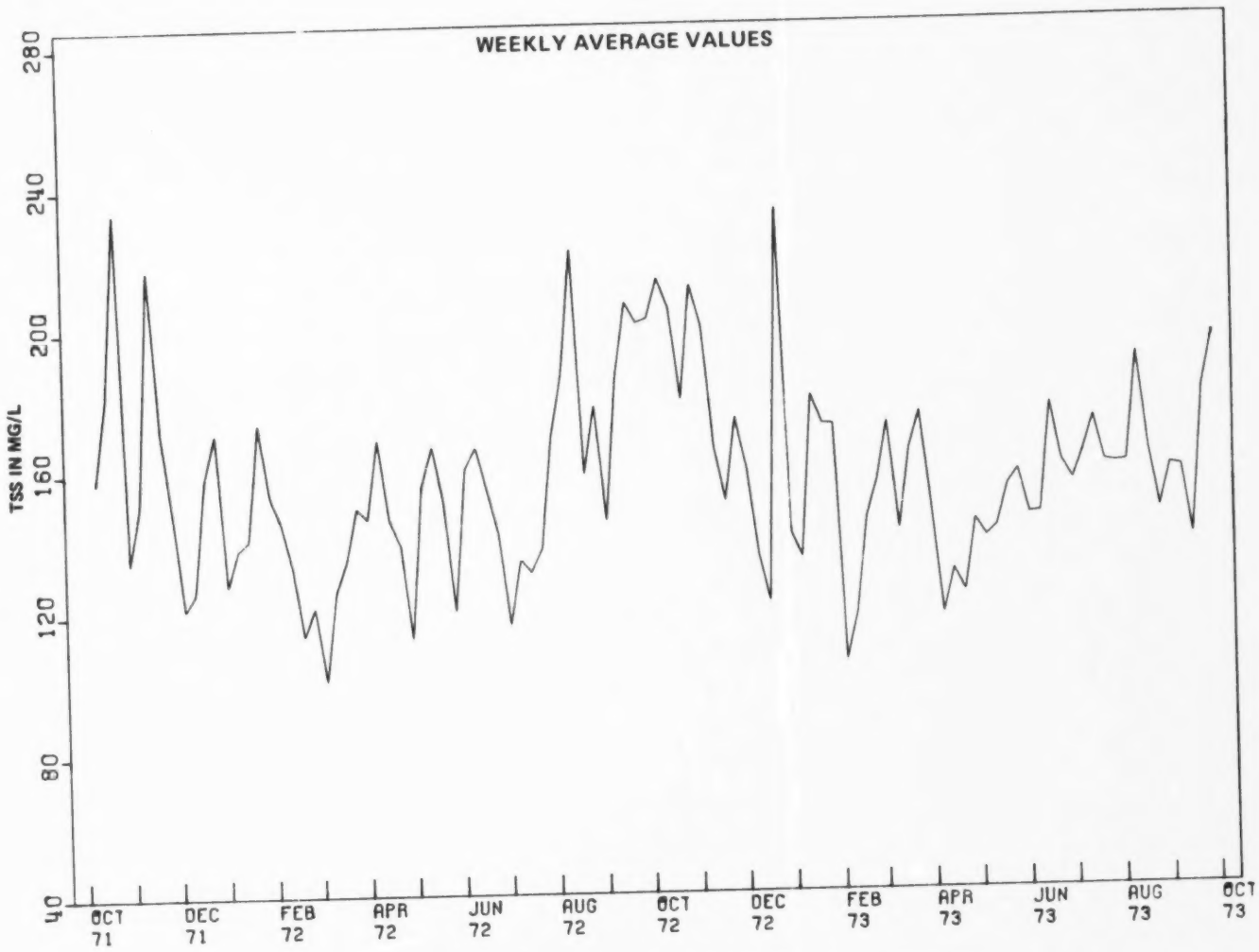


FIGURE 33. INFLUENT TOTAL SUSPENDED SOLIDS

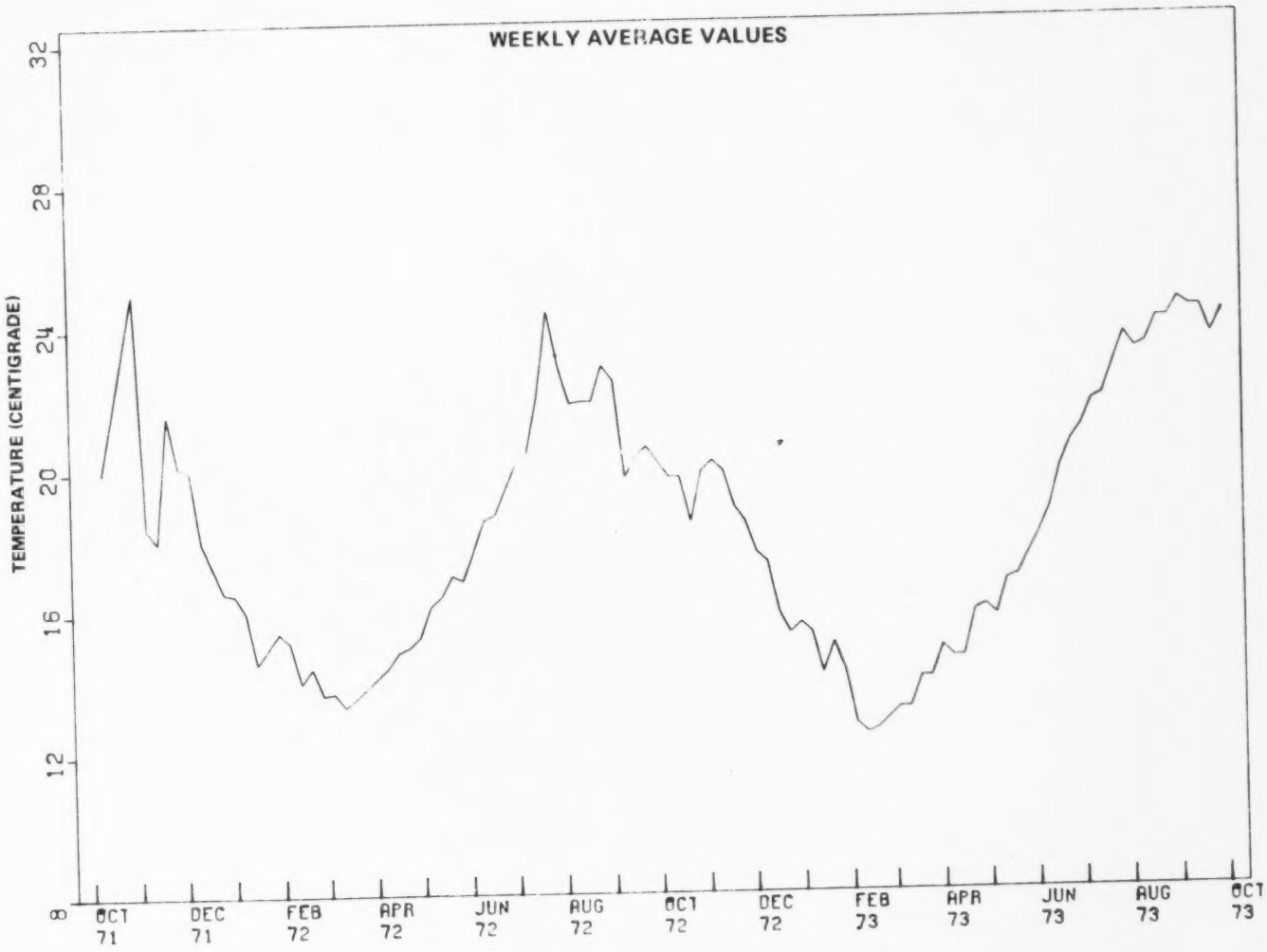


FIGURE 34. INFLUENT TEMPERATURE

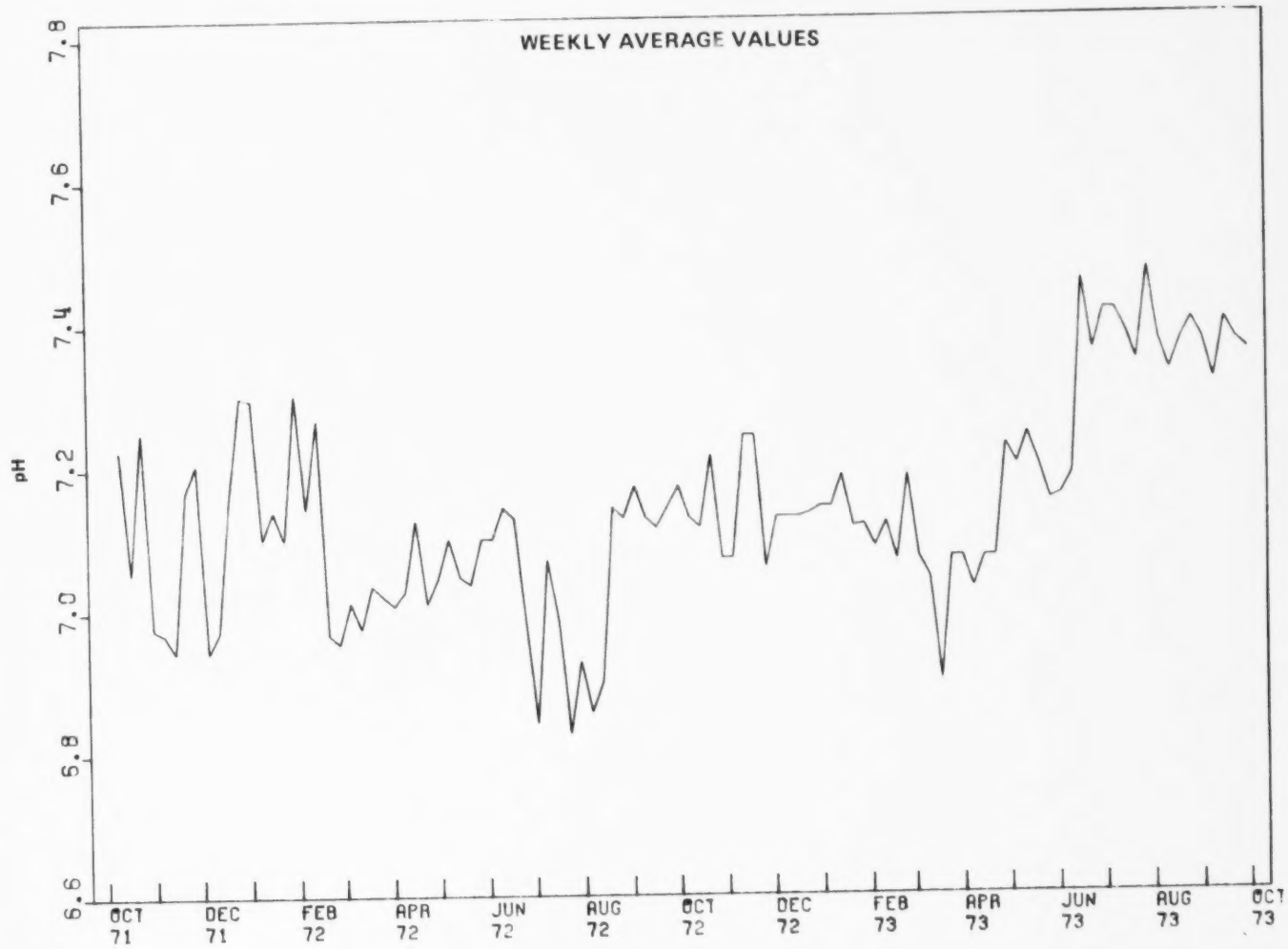


FIGURE 35. INFLUENT pH

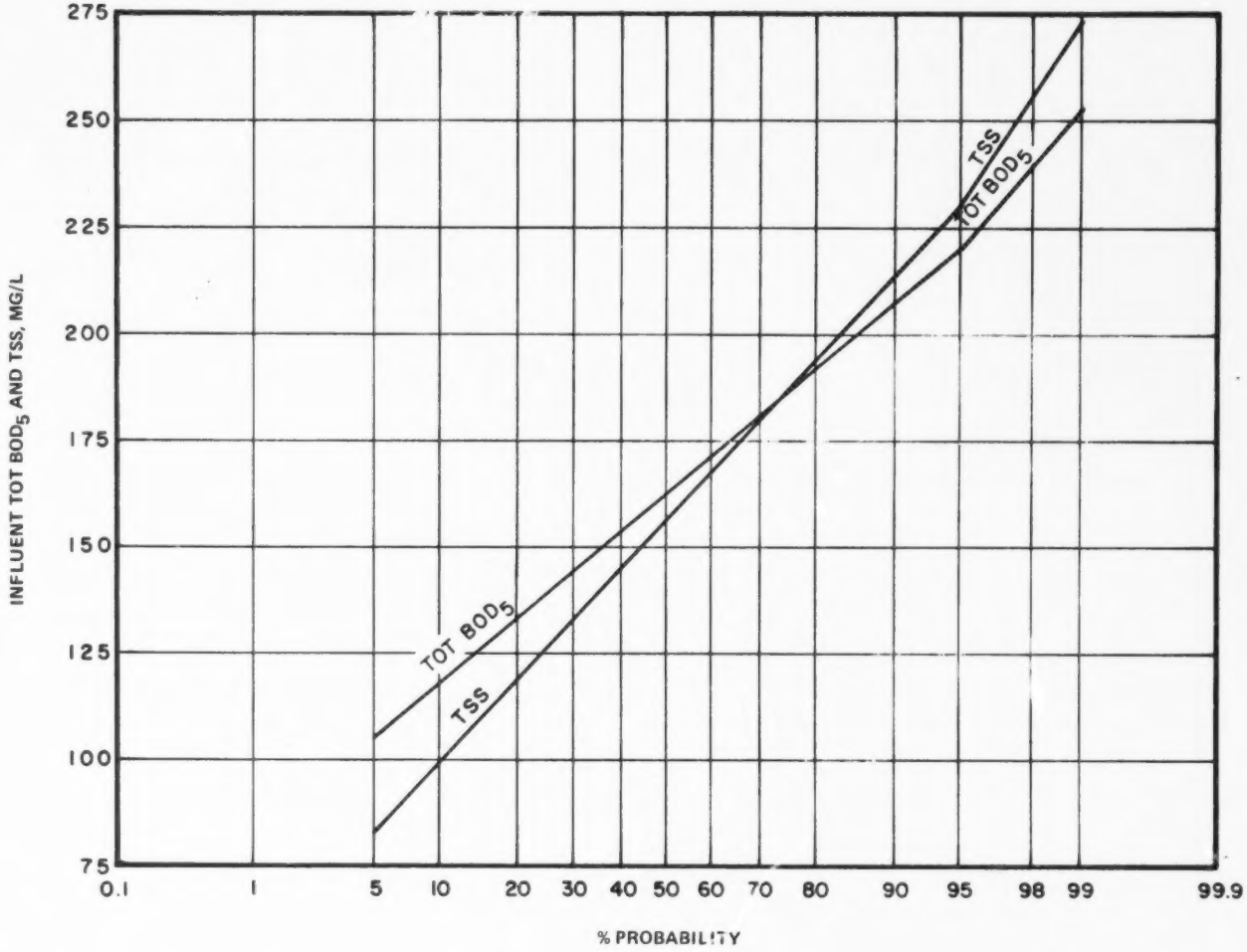


FIGURE 36. PROBABILITY OF OCCURRENCE OF INFLUENT TOTAL BOD_5 AND TSS

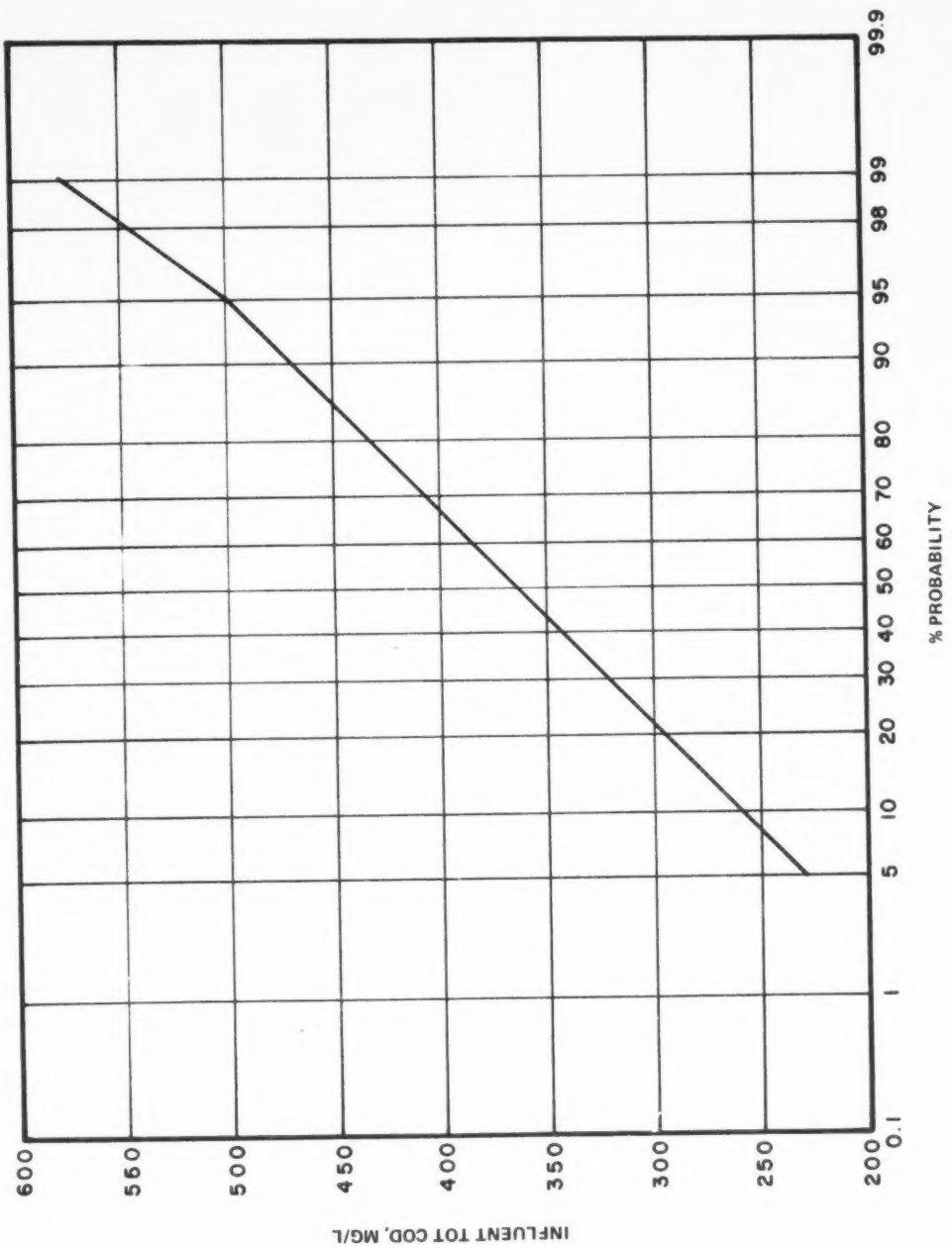


FIGURE 37. PROBABILITY OF OCCURRENCE OF INFLUENT COD

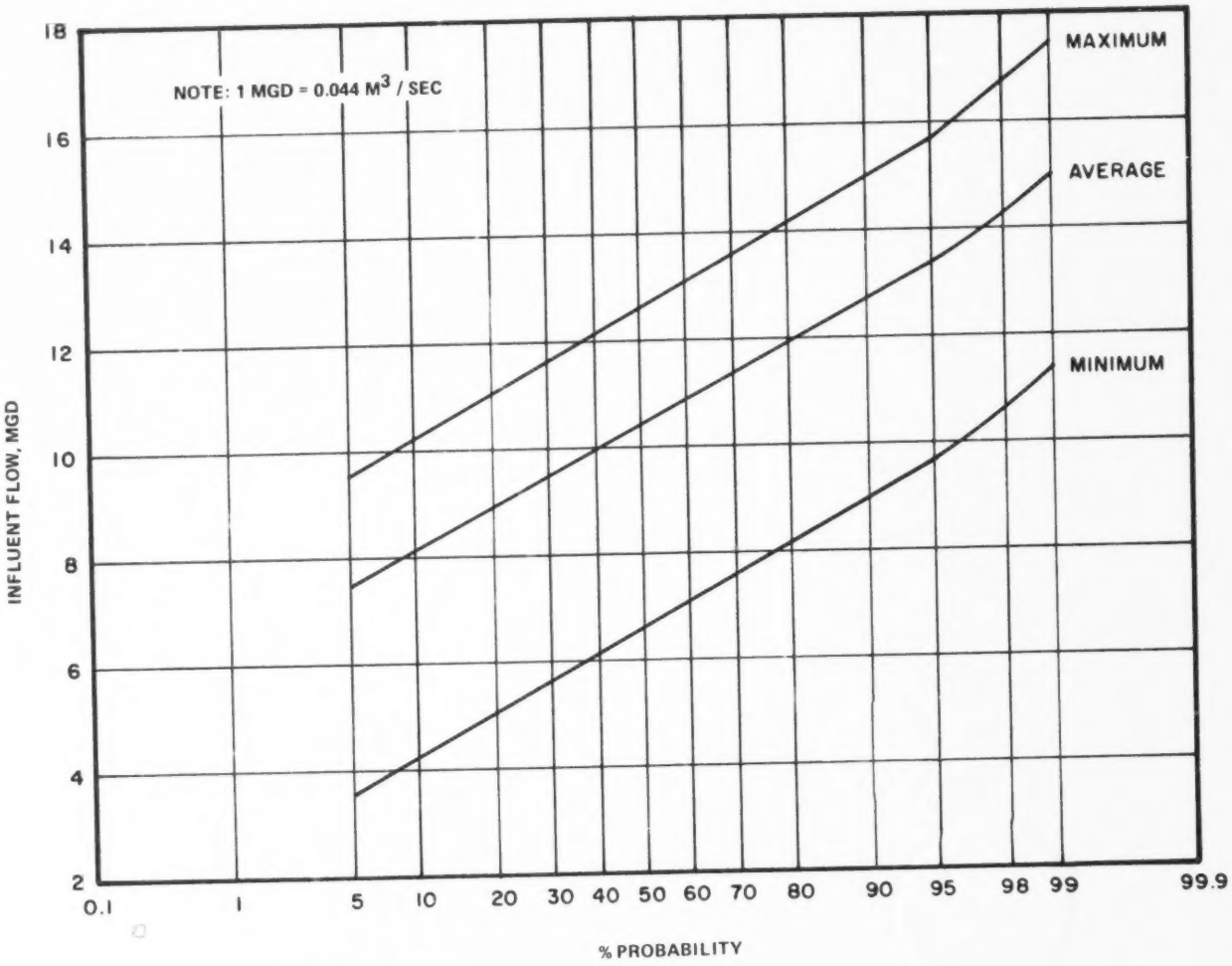


FIGURE 38. PROBABILITY OF OCCURRENCE OF DAILY MINIMUM, AVERAGE, AND MAXIMUM INFLUENT FLOWS

Of more significance but for unknown reasons, the soluble BOD_5 in the influent decreased significantly over the two-year period as seen in Figure 31.

The annual pattern of influent temperature is clearly defined in Figure 34, and slight variations of weekly influent pH are observed in Figure 35 with a maximum and minimum of 7.45 and 6.8, respectively.

Detailed performance information and operating data for the Westgate plant are tabulated in Appendix A as daily values for the entire 104-week period. Plots of weekly averages versus time reflective of plant performance are presented in Figures 39 through 44. Weekly averages of the operating variables are presented as time plots in Figures 45 through 56.

These plots permit general observation of trends in plant performance as a function of various system loadings, influent temperature, influent pH, and influent solids. System performance and stability can be seen in plots of SVI, ZSV, oxygen consumption, and total and secondary solids wasted, as well as in the effluent quality plots above. Observations derived from these plots are included in the following summary of stabilized plant operations. The plots shown in Figures 39 through 56 all contain data from October 17, 1971, through the end of the report period in September 1973. Plots of effluent quality as the plant was brought on-stream (October 1971 to January 1972), optimized (February 1972 to May 1972), and finally brought to stable operation (June 1972) are strongly reflective of the plant condition on a week-to-week basis.

Total effluent BOD_5, following the initiation of operations on October 17, 1971, dropped gradually to values consistently below 20 mg/l after June 1972, as shown in Figure 39. Control problems associated with clarifiers and the sludge recycle system are reflected in effluent quality during the initial months of operation.

Only on two occasions after June 1972, and then only briefly, did the quality of the effluent deteriorate. The first of these problems in late August of 1972 was caused by problems with solids wasting equipment, and hence, accumulation of solids in the secondary clarifiers to levels which were detrimental to effluent quality. This is indicated in Figure 43 which shows a peak in effluent TSS, and in Figure 52 it is indicated by a rapid increase in sludge blanket depth occurring at the time. The full extent of the problem, however, is not evident in the weekly average value of sludge blanket depths plotted. The daily data (Appendix A) for the dates of August 31, 1972, through September 3, 1972, reflect sudden and uniquely high values of TSS, BOD_5, and COD in the effluent. Data on either side of this four-day period reflect normal effluent quality. This fact lends support to the hypothesis that the September 1972 effluent quality breakdown was one of solids inventory management and was unrelated to oxygen reactor performance. The more modest instability in effluent solids through early January 1973 illustrated in Figure 43 is reflective of continuing solids handling problems and high sludge blanket depths for the four months immediately following the above four-day period.

The second occasion of deterioration in effluent quality, although relatively mild, was May through June of 1973. During a short period, effluent total BOD_5 averaged greater than 20 mg/l. The deterioration was apparently caused

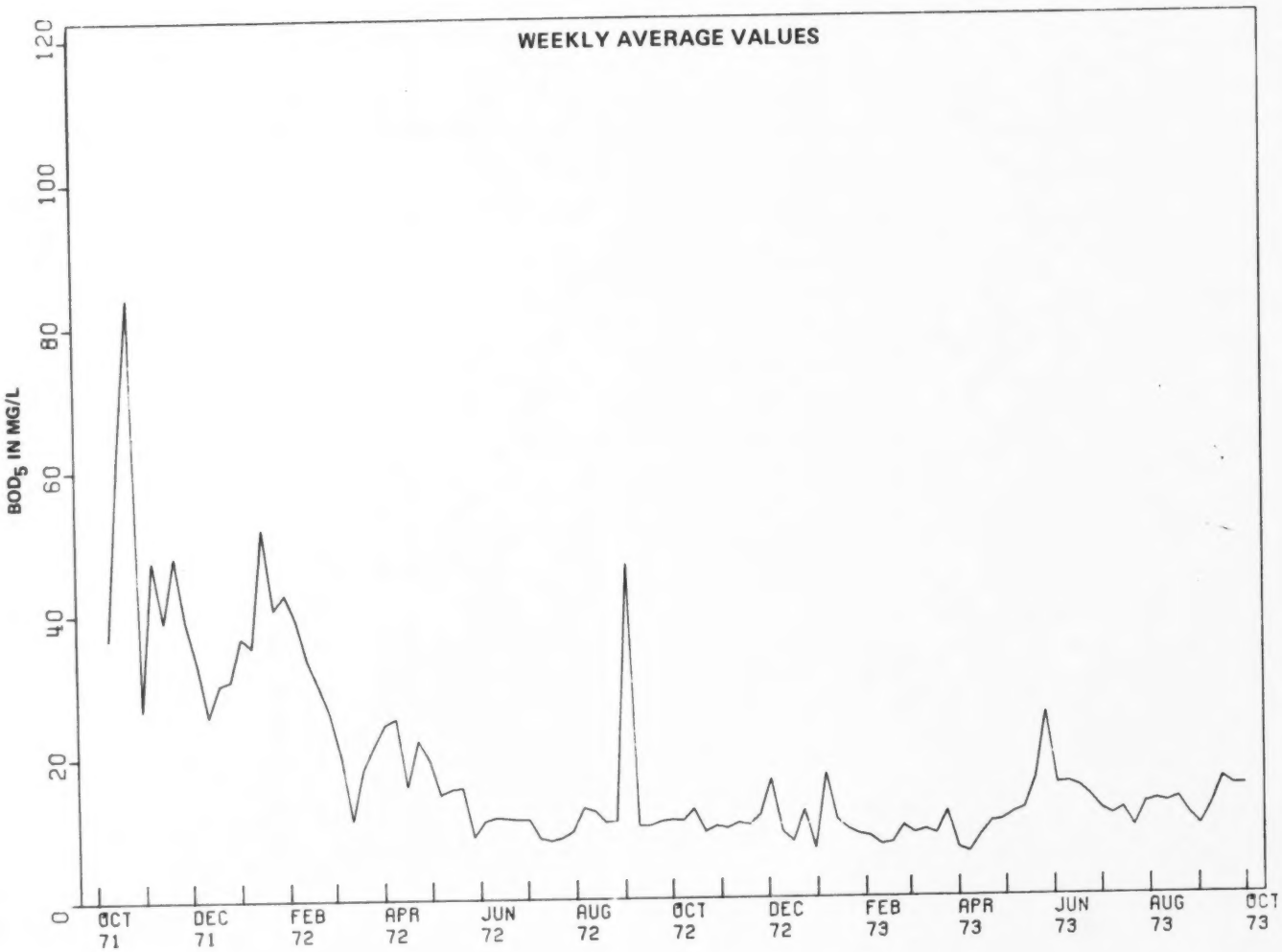


FIGURE 39. EFFLUENT BOD_5

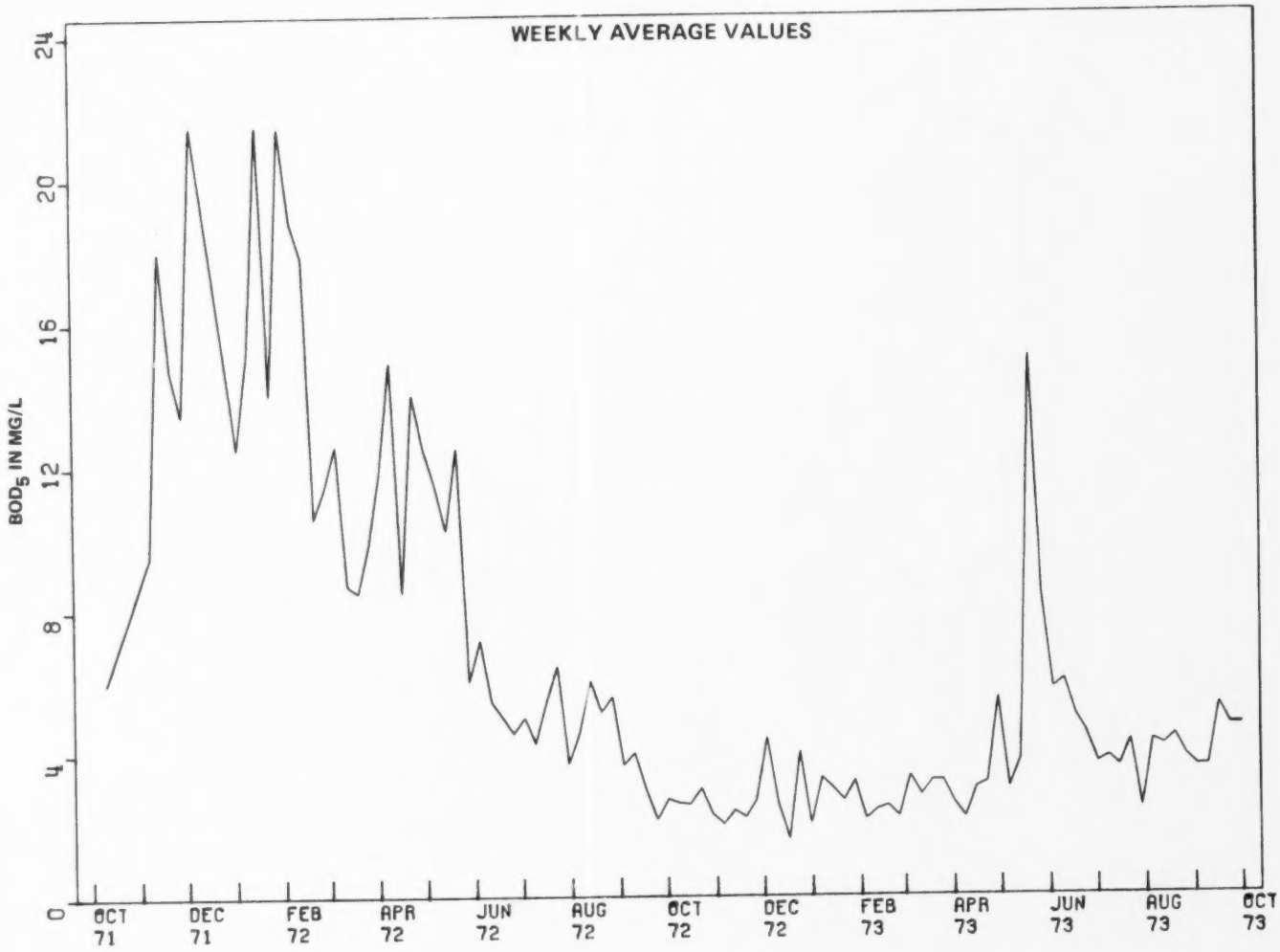


FIGURE 40. EFFLUENT SOLUBLE BOD_5

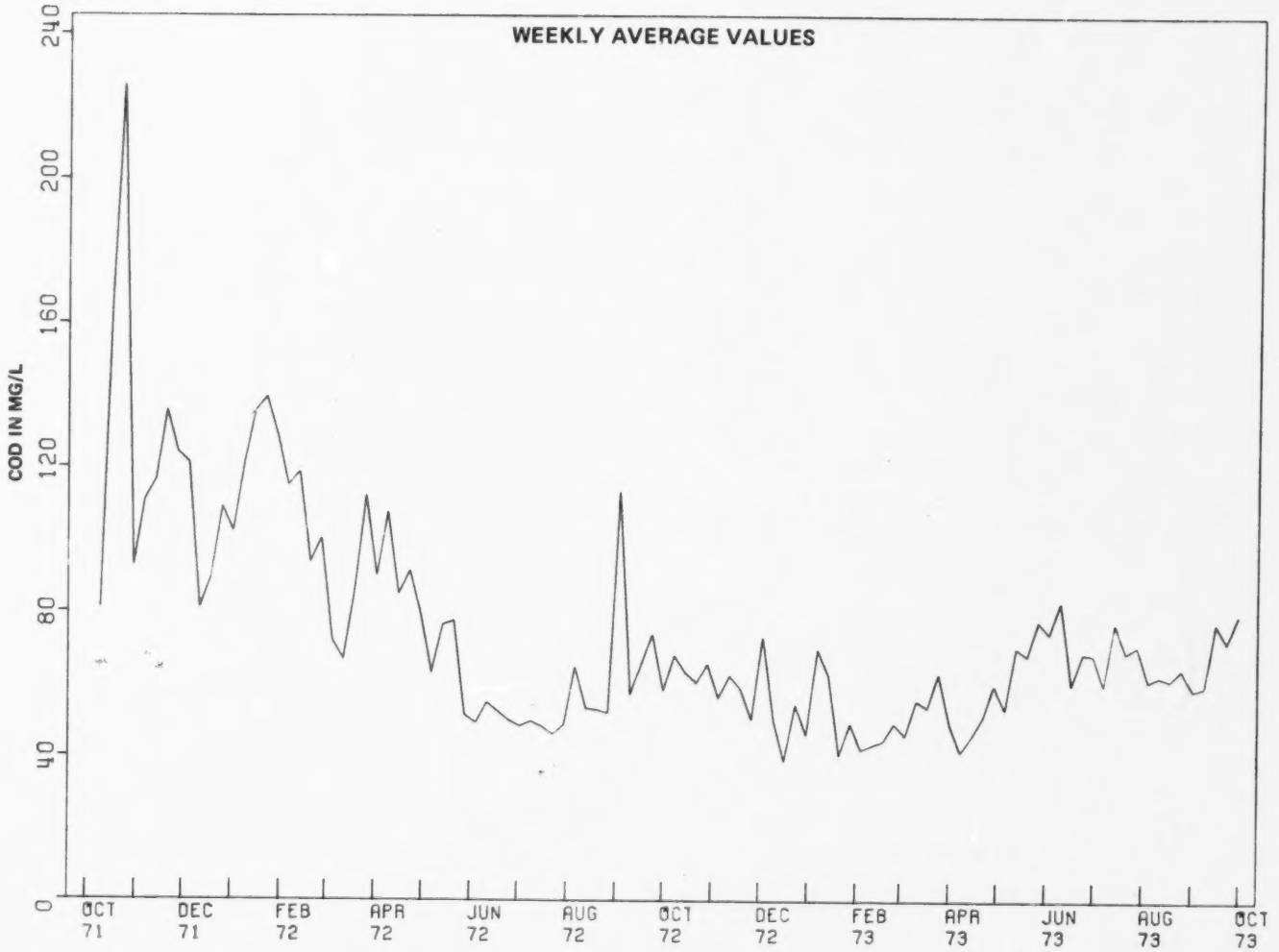


FIGURE 41. EFFLUENT COD

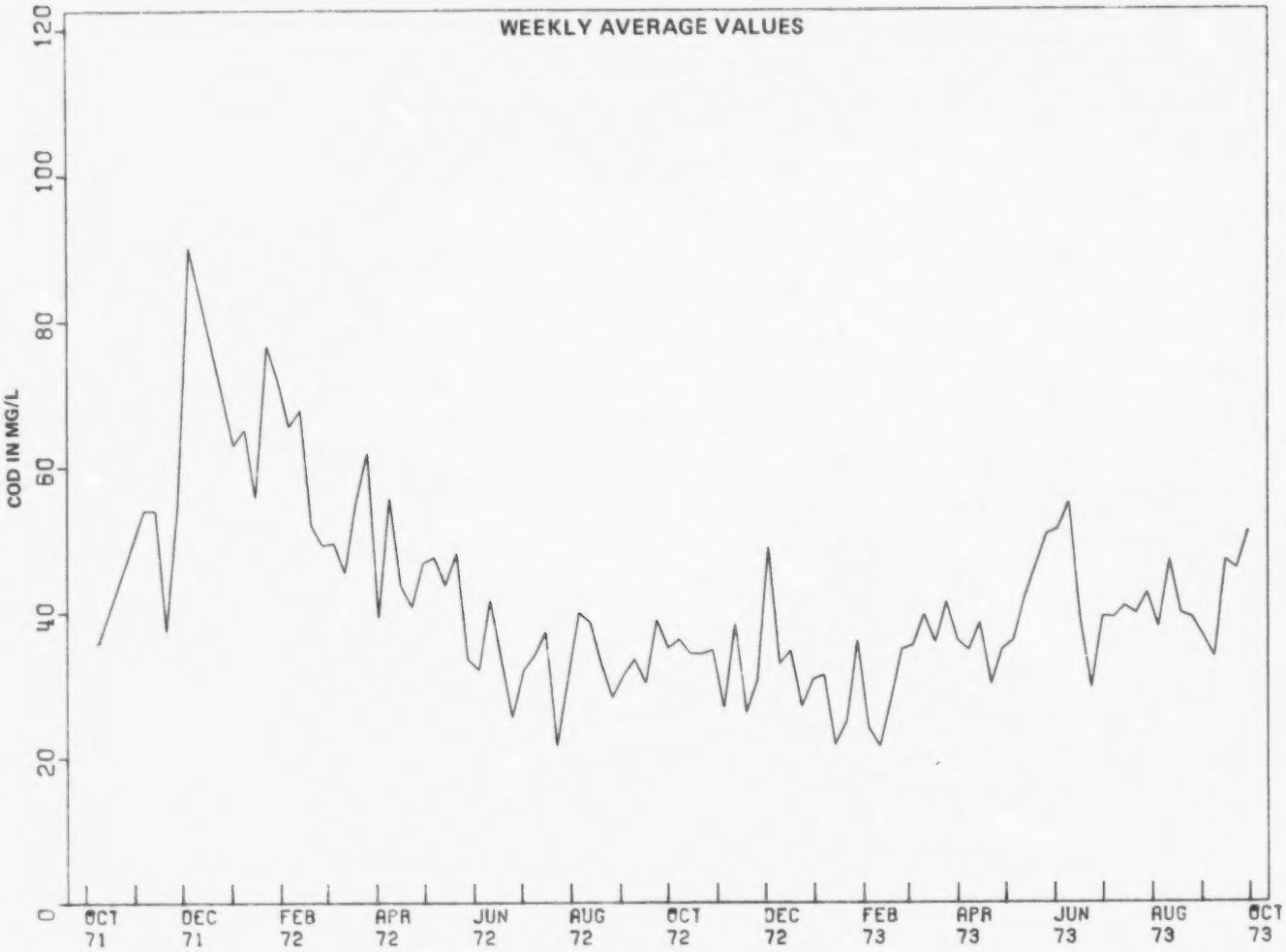


FIGURE 42. EFFLUENT SOLUBLE COD

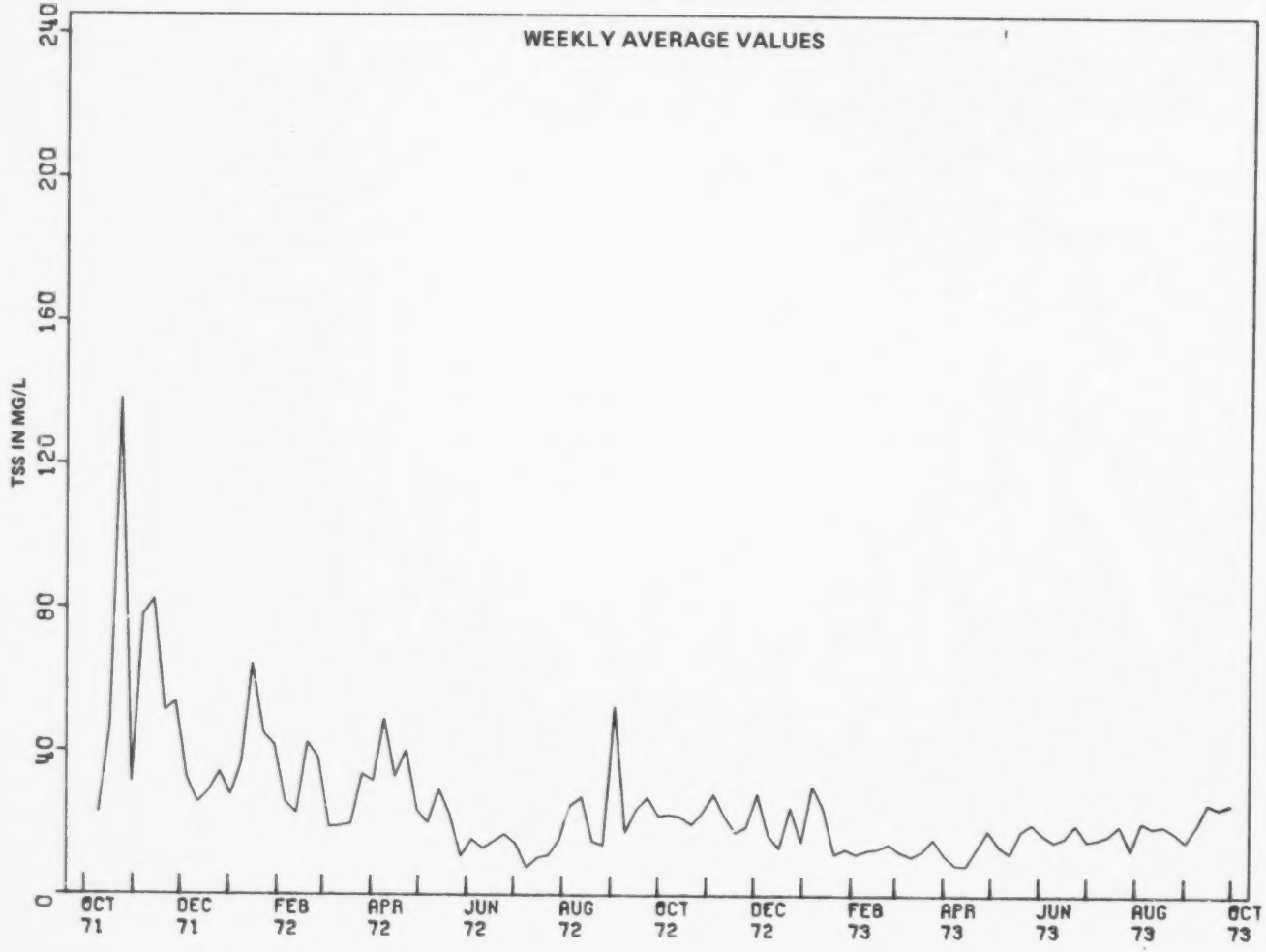


FIGURE 43. EFFLUENT TOTAL SUSPENDED SOLIDS

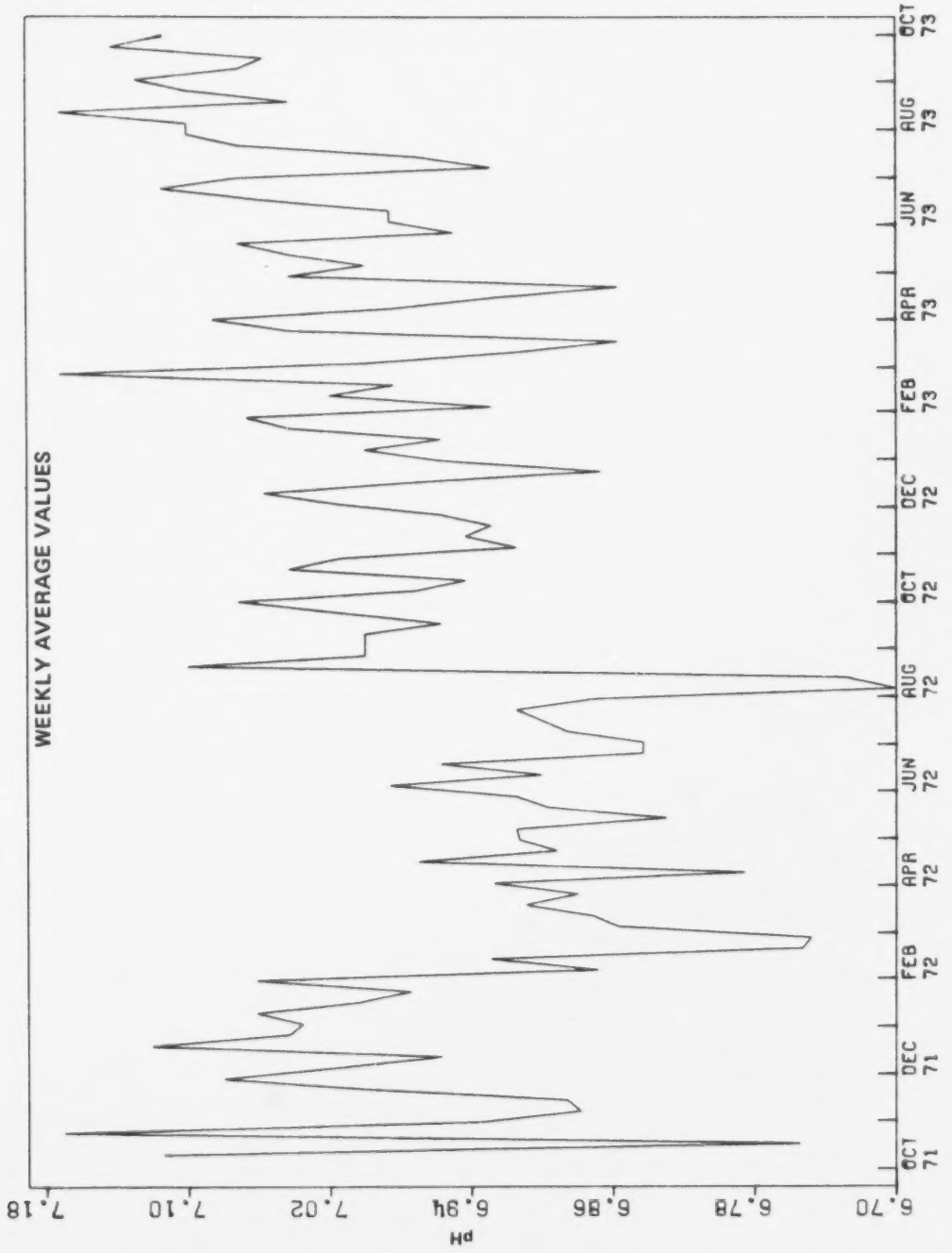


FIGURE 44. EFFLUENT pH

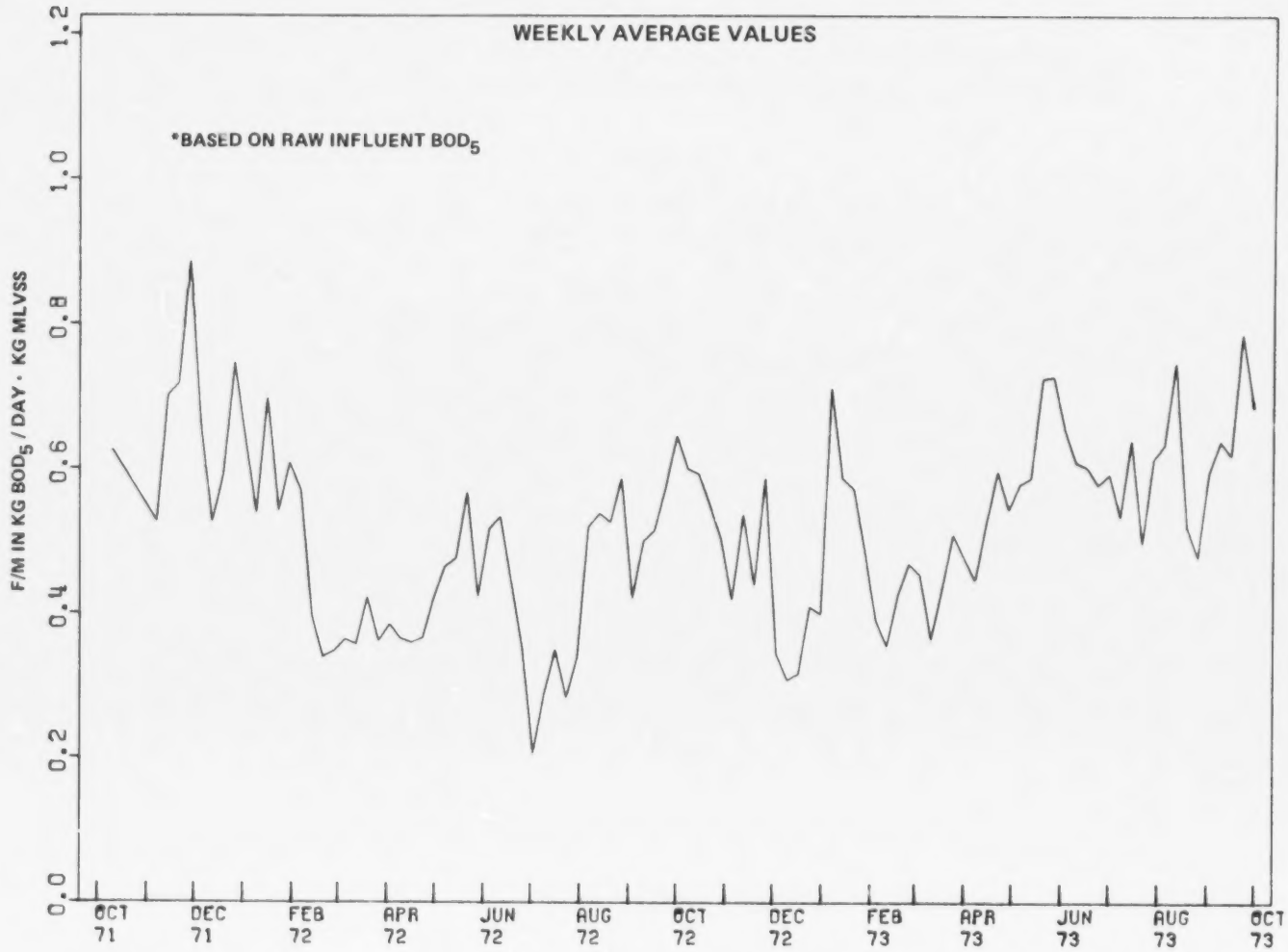


FIGURE 45. BIOMASS LOADING (F/M)*

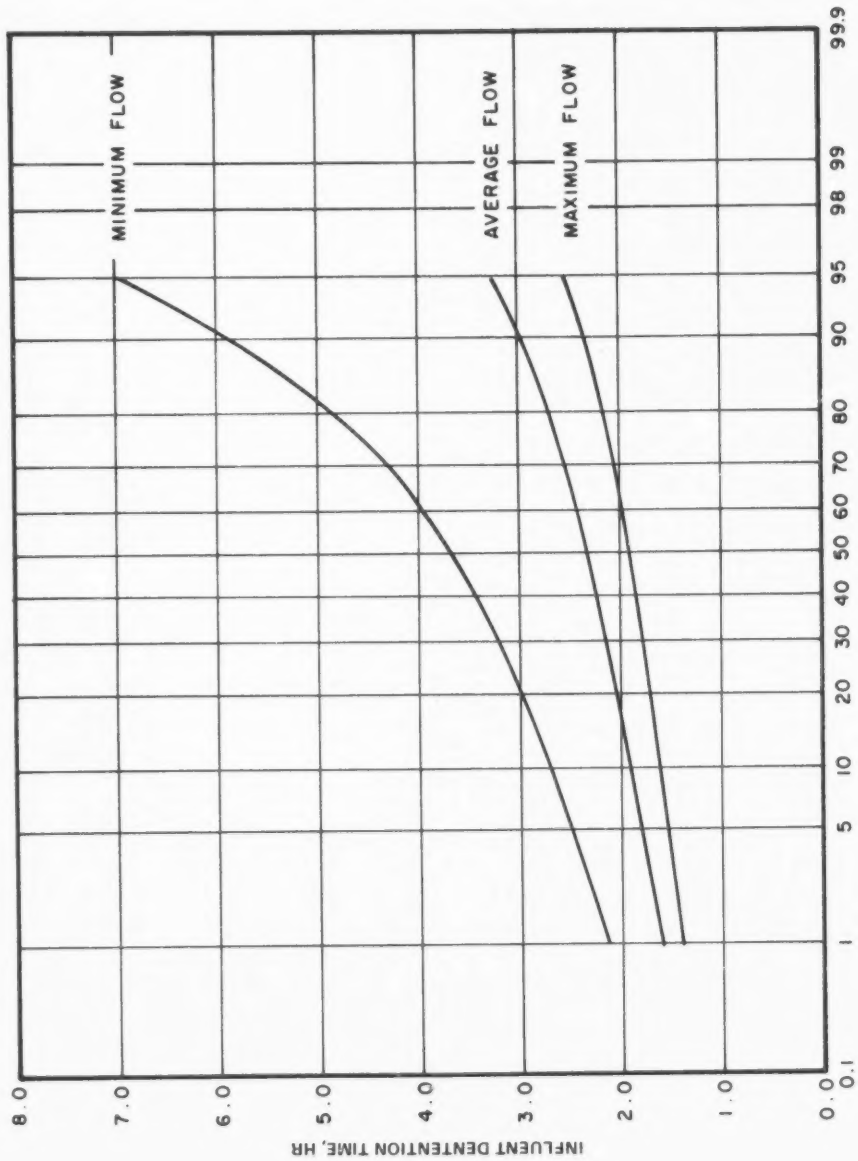


FIGURE 46. PROBABLITY OF OCCURRENCE OF INFLUENT DETENTION TIME BASED ON DAILY MINIMUN, AVERAGE, AND MAXIMUM INFLUENT FLOWS

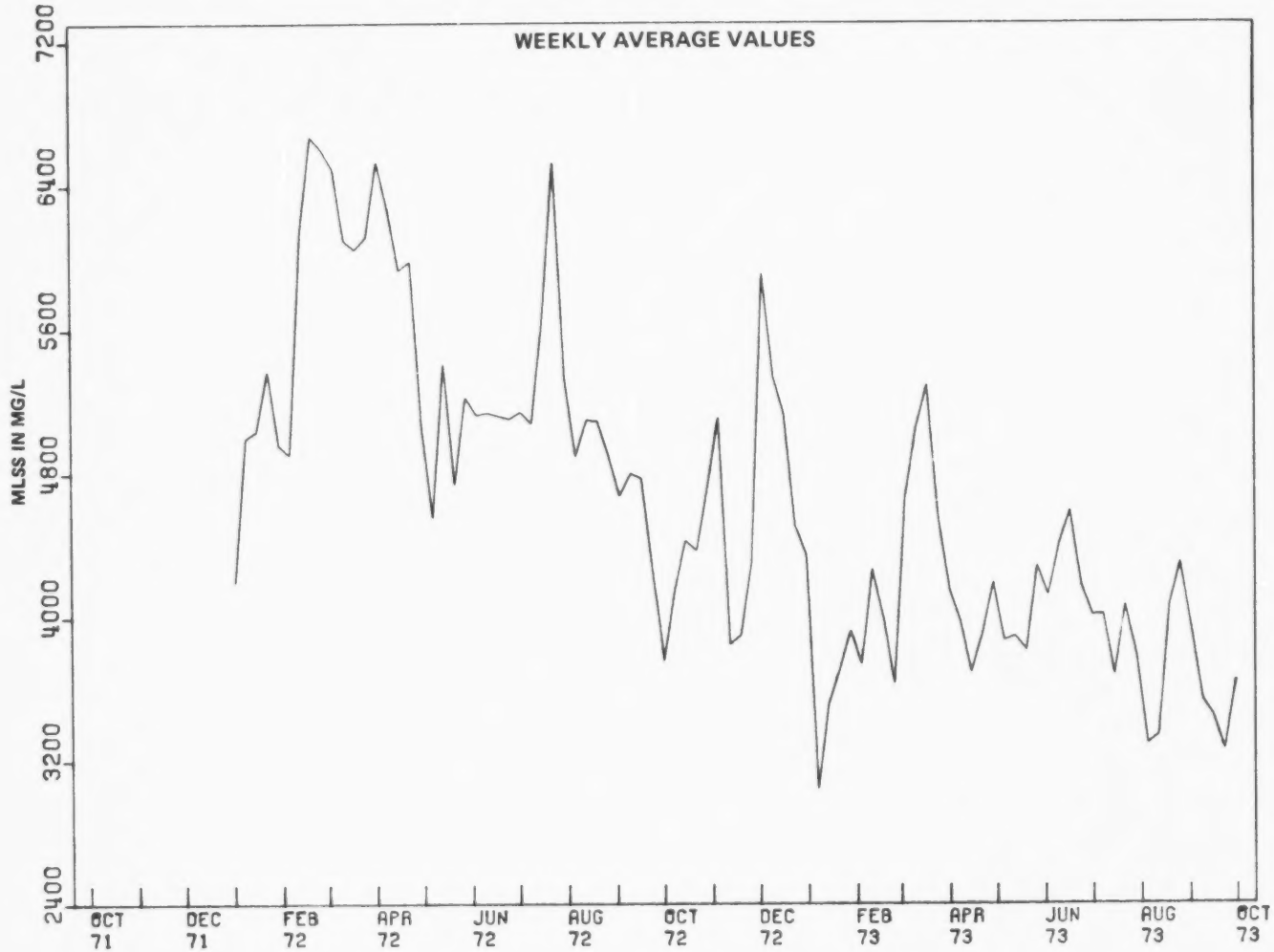


FIGURE 47. MIXED LIQUOR SUSPENDED SOLIDS

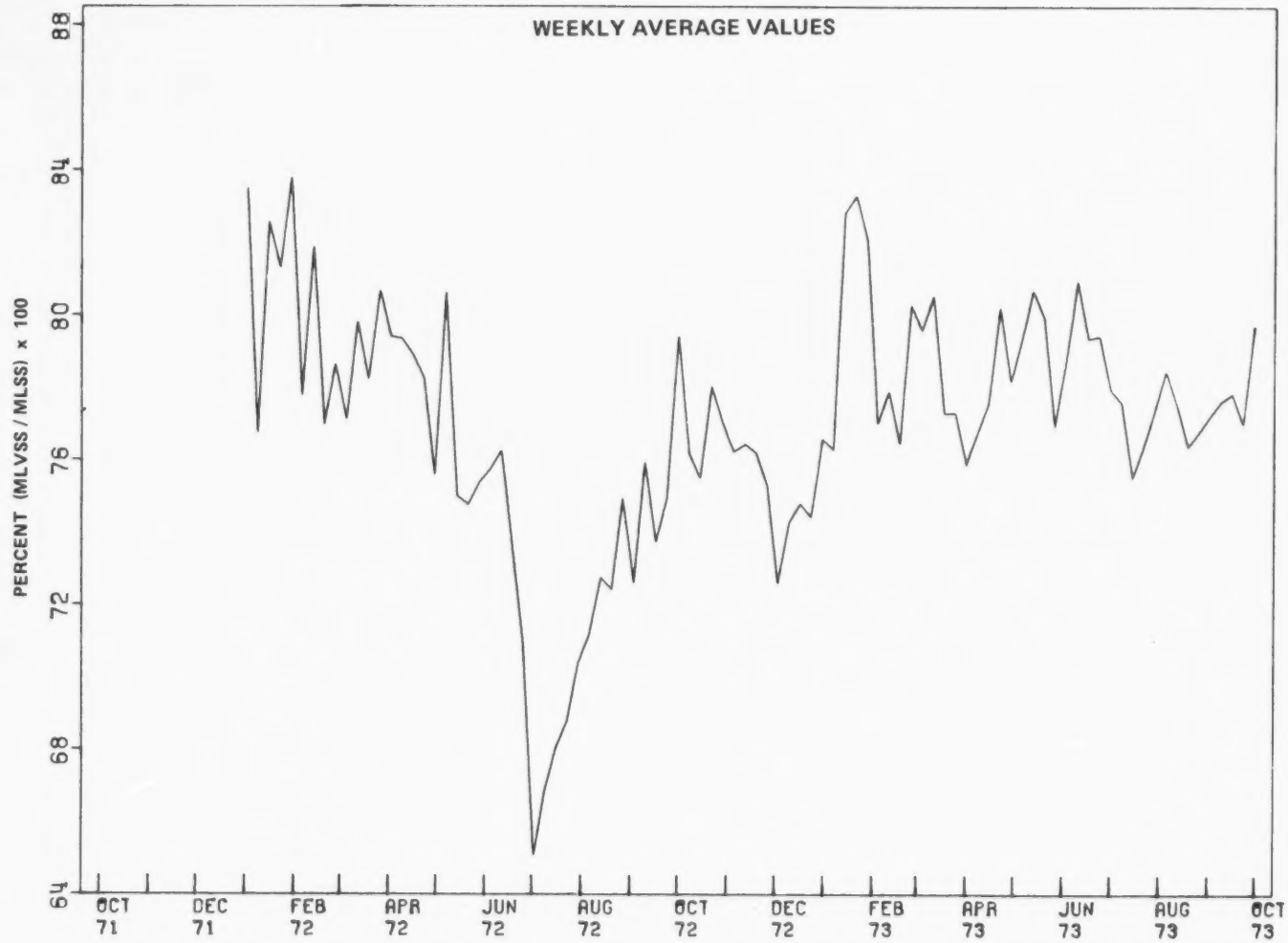


FIGURE 48. MIXED LIQUOR VOLATILE SUSPENDED SOLIDS (PERCENT)

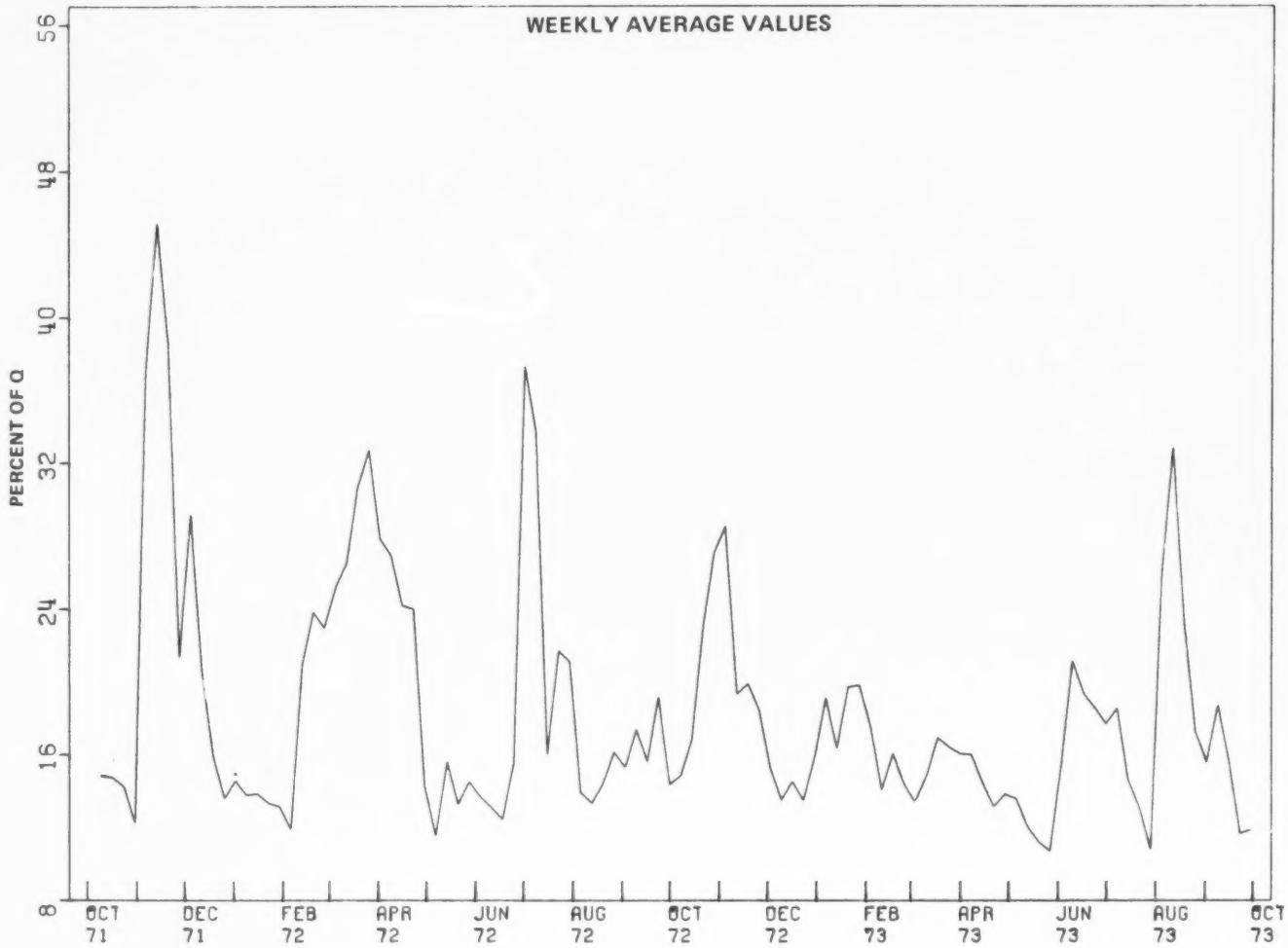


FIGURE 49. RECYCLE FLOW (PERCENT OF Q)

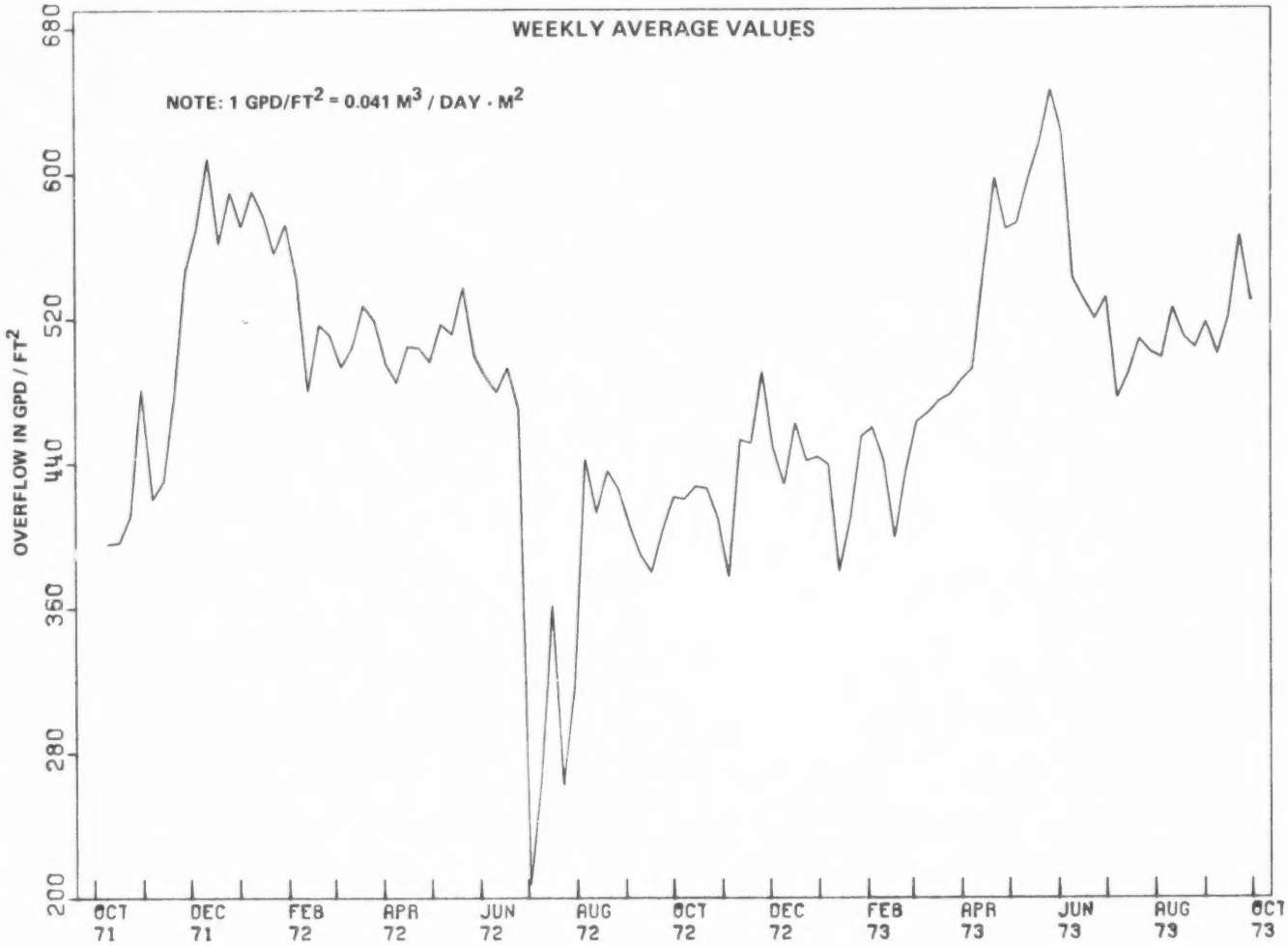


FIGURE 50. SECONDARY CLARIFIER OVERFLOW RATE

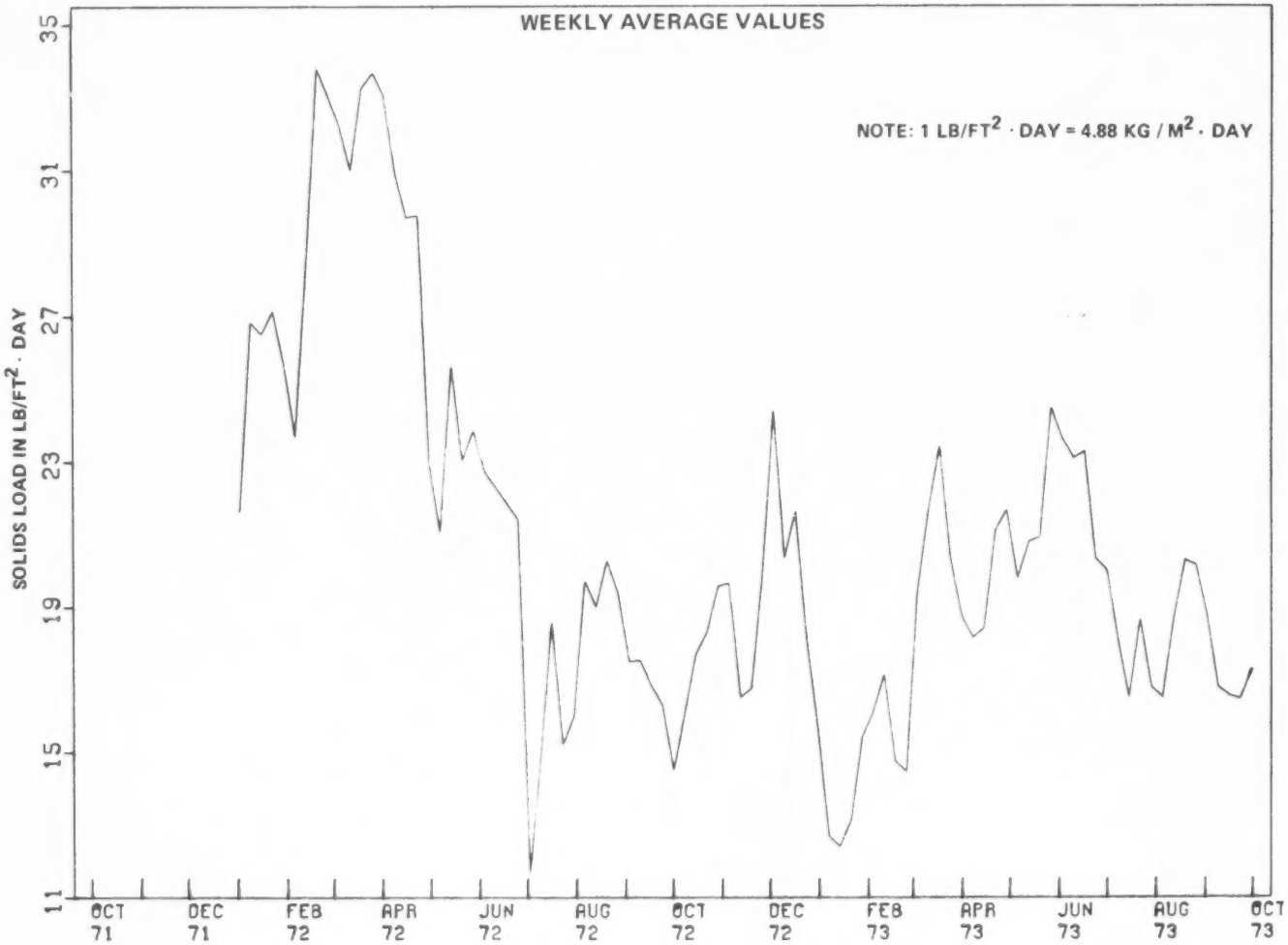


FIGURE 51. SECONDARY CLARIFIER SOLIDS LOADING

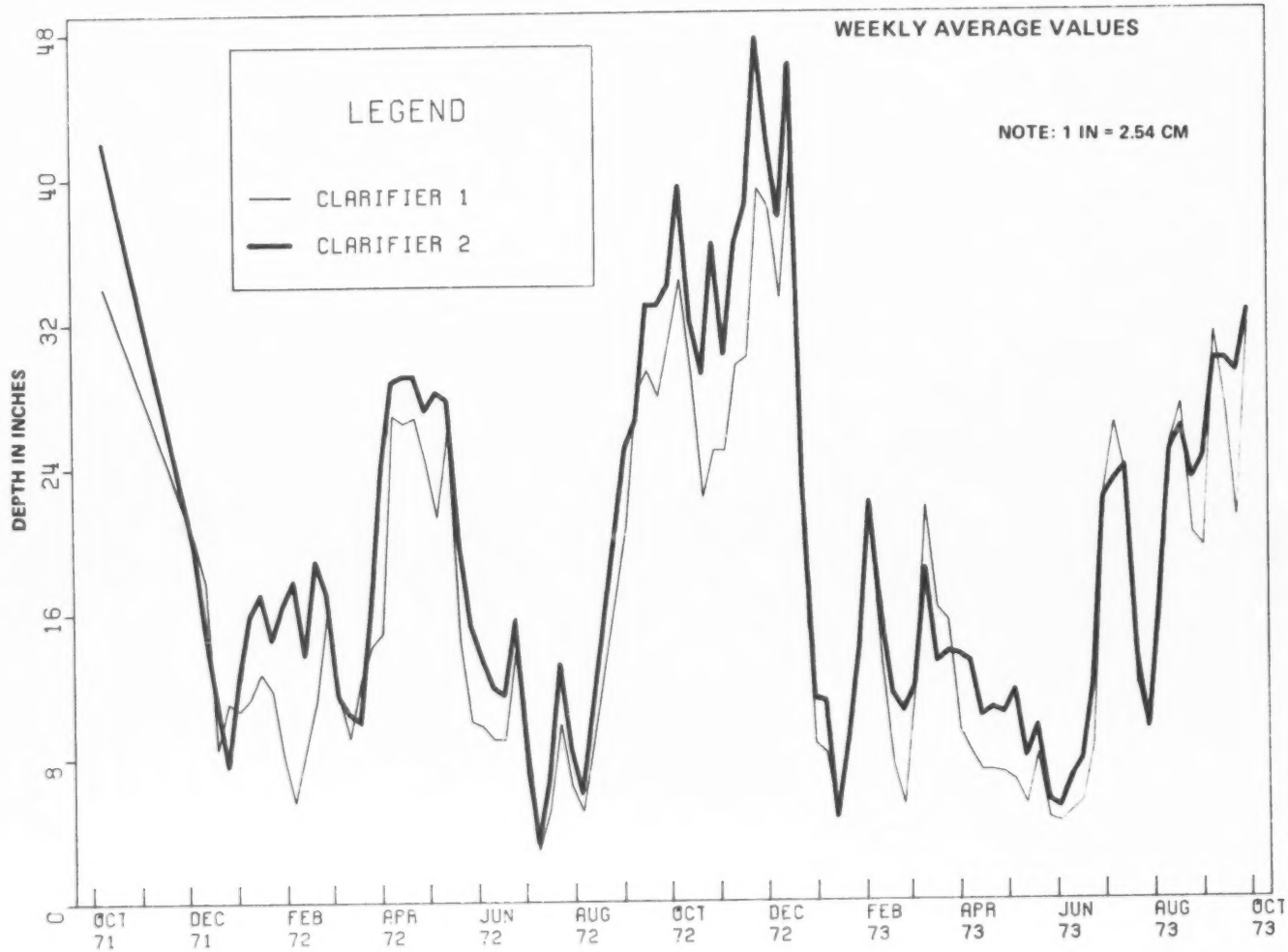


FIGURE 52. SECONDARY CLARIFIER SLUDGE BLANKET DEPTH

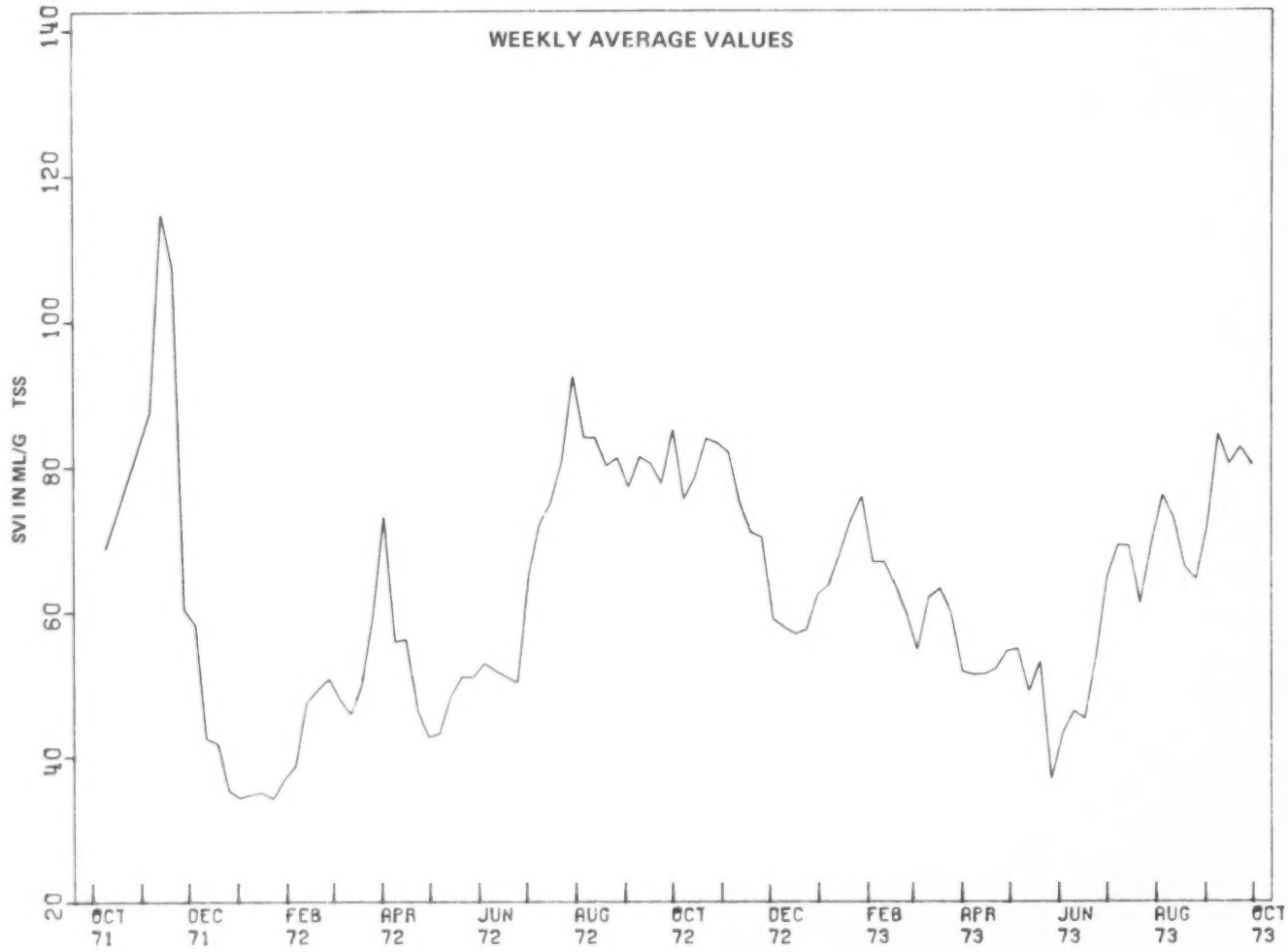


FIGURE 53. MIXED LIQUOR SLUDGE VOLUME INDEX (SVI)

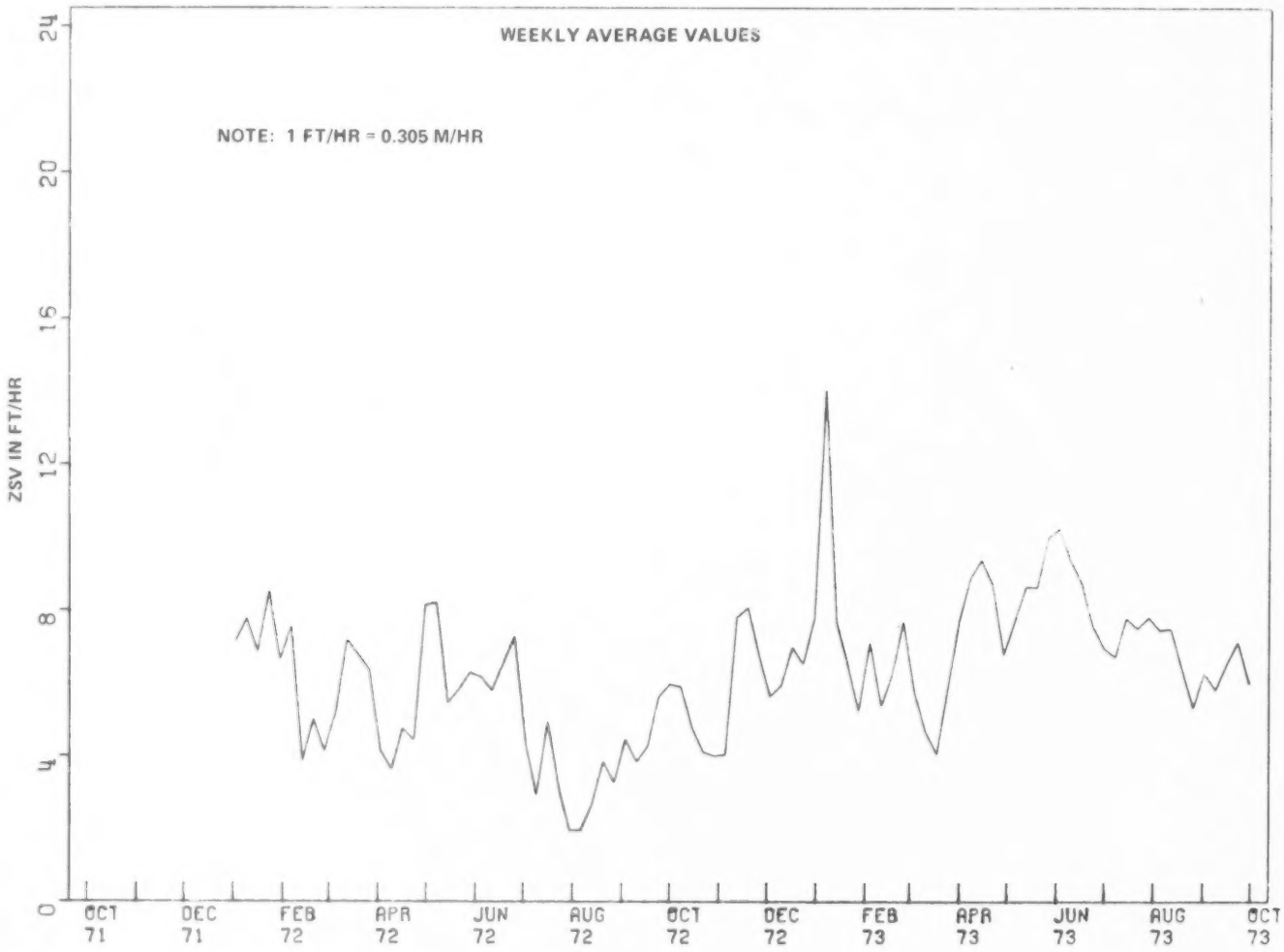


FIGURE 54. MIXED LIQUOR ZONE SETTLING VELOCITY (ZSV)

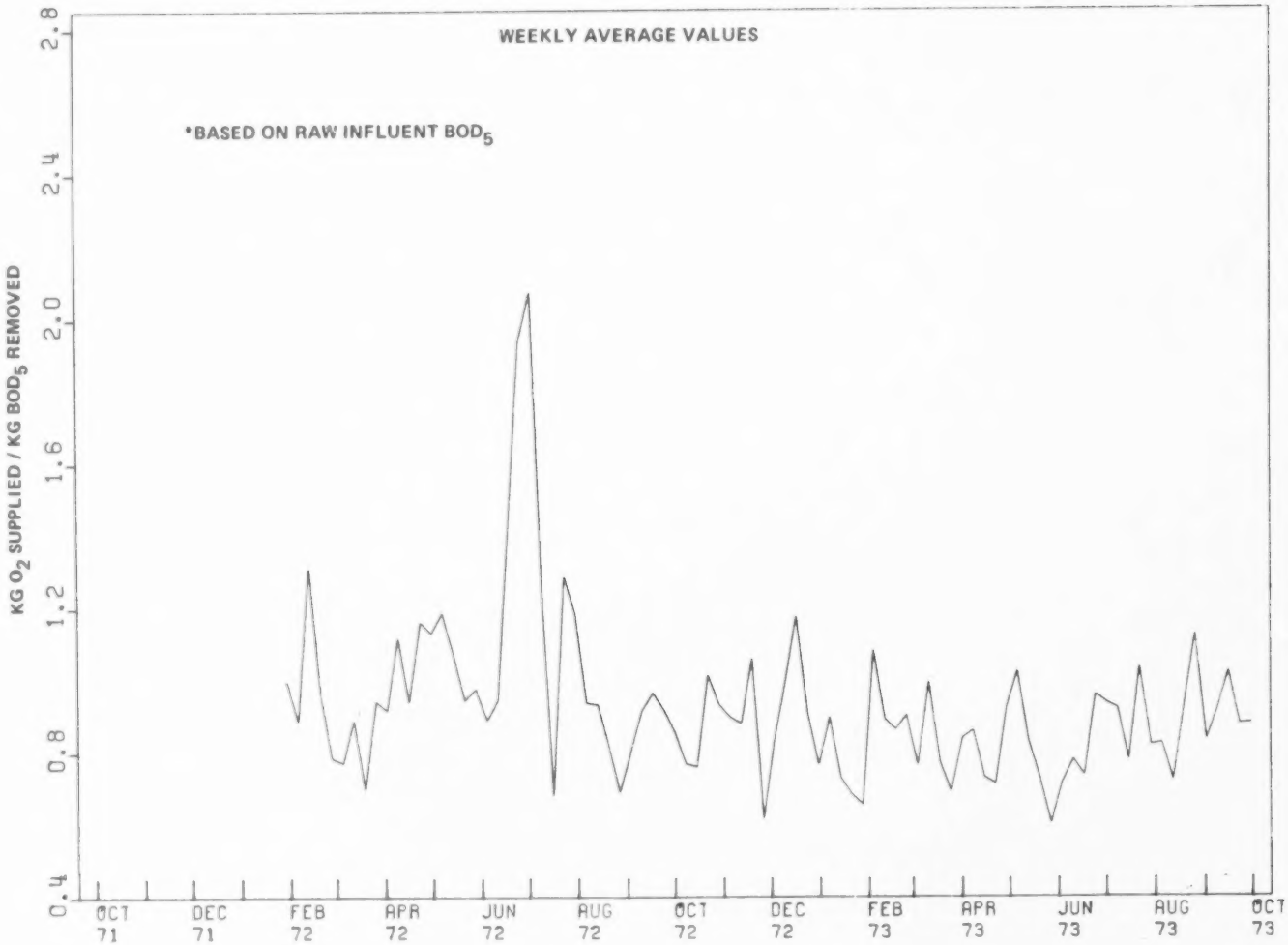


FIGURE 55. O_2 SUPPLIED/BOD_5 REMOVED

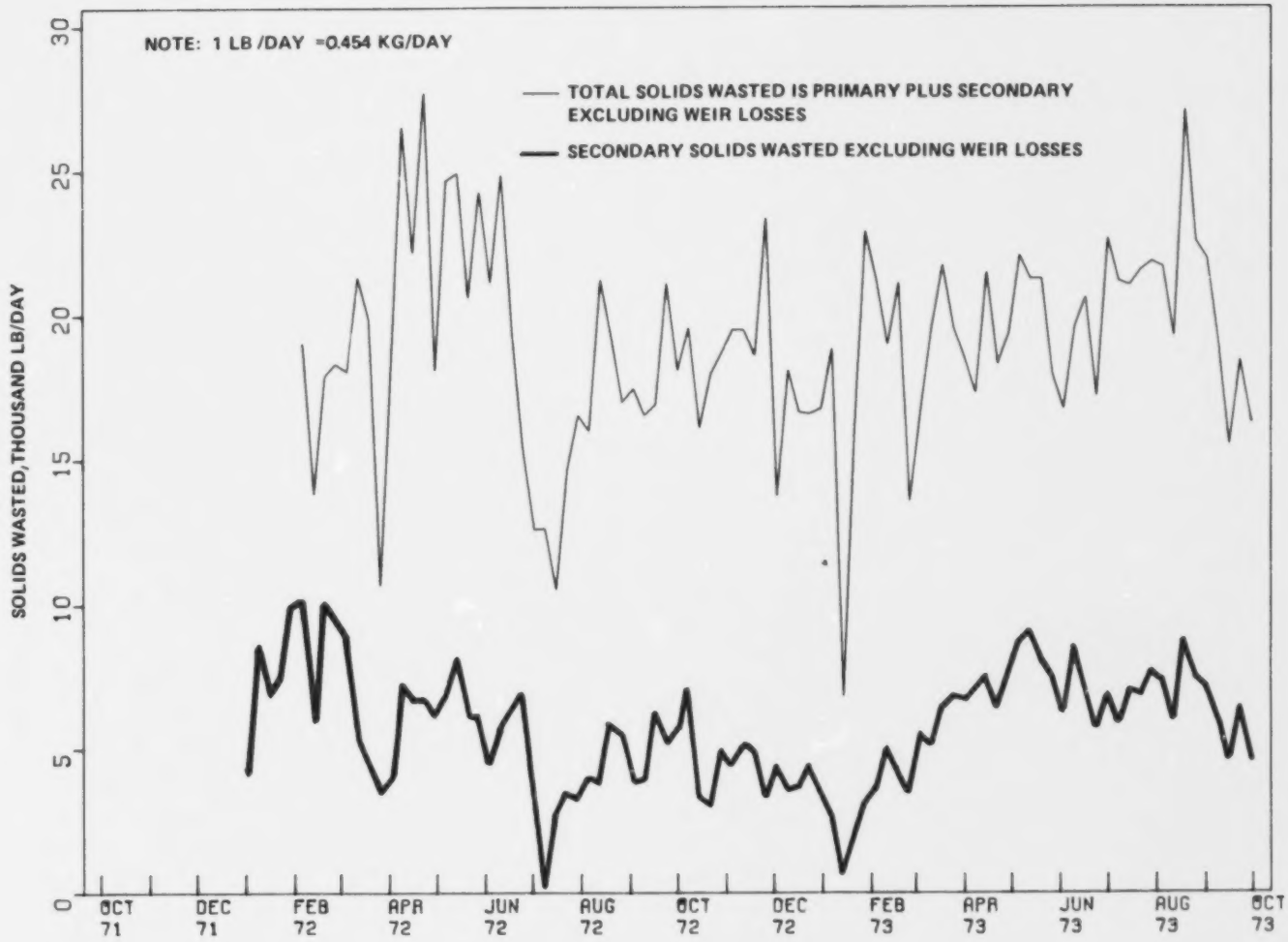


FIGURE 56. TOTAL AND SECONDARY SOLIDS WASTING

by the inflow of toxic materials identified by the plant superintendent as chromium and copper. The character of the toxic shock as opposed to a solids management problem is indicated by the behavior of the effluent soluble BOD_5 during this period, as shown in Figure 40. The toxic substances clearly had an effect on effluent soluble BOD_5.

The toxic materials, first received in appreciable amounts on approximately May 20, 1973, upset the system with continued severe occurrence through May 24, at which time the system performance had deteriorated to a low of 74 percent total BOD_5 removal. Subsequently, the toxic materials tapered off to levels which were no longer of sufficient concentration to cause serious problems. The system recovered very rapidly to 85 percent removal by May 25, 1973, and to 90 percent by May 31, 1973.

The occurrence of the toxic materials coincided with the introduction of some industrial influent into the plant as a part of a program to increase flow to the Westgate plant and utilize more fully the capabilities of the oxygen-activated sludge system. The exact source of the heavy metal contaminants was not pinpointed. Following the onset of stabilized operations in June 1972, the inflow of these metals was the only incident which seriously affected soluble BOD_5 removal. Otherwise, through the remainder of the reporting period, effluent soluble BOD_5 was typically less than 5 mg/l.

The influence of seasonal changes in temperature on the operating variables and performance of the Westgate plant can be observed by using the plot of influent temperature as a function of time (Figure 34) for comparison. There were some minor trends to weaker influent strength during cold weather. This trend was stronger in the case of TSS and total COD than for total BOD_5 (Figures 33, 32, and 30, respectively). Influent flow rate or hydraulic loading on the Westgate plant (Figure 29) was rather independent of the season because the influent is force fed to the plant.

A central feature of the graphic presentation of flow rates at Westgate is the drop in flow during late June through early August of 1972. This represents the effects of the severe damage done to the collector system in Fairfax County, Virginia, when Hurricane Agnes ravaged the area on June 22, 1972. For some time afterwards, the flows to Westgate were relatively low.

The most reliable measure of the effects of seasonal variation in loading on the plant should be the food to microorganism ratio (F/M)* which is plotted in Figure 45. However, it is difficult to discern a definable trend of F/M with influent temperature. The disruptive influence of Agnes broke the trend in the F/M plot at a point in time (June 1972 to September 1972) when loadings should have peaked out.

One major area of interest to engineers relative to oxygen-activated sludge systems has been the effects of seasonal variations on sludge properties, effluent TSS, and effluent quality as a whole. Figure 53 shows the trend in SVI versus time. When compared with Figure 34, wastewater temperature does

*F/M is also referred to as biomass loading

appear to have had some effect on SVI; however, the effect was opposite of what would normally be expected, i.e., as the wastewater temperature decreased, SVI values also decreased. Similar trends in ZSV (Figure 54) were not observed with seasonal changes. A continuous trend downward in MLSS concentration over a the two-year reporting period tends to cloud the ZSV data because ZSV is largely a function of solids level.

The effect of wastewater temperature on effluent TSS (Figures 34 versus 43) appeared to be negligible as was the apparent effect of SVI on effluent TSS (Figures 53 versus 43). Figures 57 through 61 where effluent quality values excluding startup and optimization data are plotted as weekly averages against weekly average influent temperature further indicate that wastewater temperature had little effect on effluent BOD_5, COD, or TSS values. These plots along with Figures 39 through 43 clearly show that the fully acclimatized oxygen-activated sludge system produced a high quality effluent throughout the 1972-1973 winter season.

The effects of wastewater temperature on oxygen consumption (Figure 62) and sludge production were negligible relative to the effects of F/M on these parameters. Slight but long term trends, over the period of February 1972 through September 1973, toward reduced oxygen consumption per unit of BOD_5 removed and increased sludge production can be discerned in Figures 55 and 56, respectively, in accordance with a very subtle trend to increased F/M loadings in Figure 45. Wastewater temperature did affect oxygen consumption as detected by changes in gas phase composition and vent rates, but changes in plant loading tended to mask these effects.

Because the range of biomass loadings reported at Westgate is relatively narrow, it is difficult to draw conclusions as to the effect of biomass loading on system performance. Cross plots of F/M calculated using raw influent total BOD_5, as previously discussed in this section, and effluent BOD_5, COD, and the BOD_5 exerted by the effluent suspended solids [(total BOD_5-soluble BOD_5/TSS] (Figures 63, 64, and 65) do reflect the response of the system to increased loading exclusive of the startup and optimization periods. It is apparent that the soluble BOD_5 in the effluent was very stable to loading changes within the F/M range of 0.2 to 0.8 kg total BOD_5 applied/day·kg MLVSS under oxygenation (lb/day·lb). The level of biological activity within the effluent solids generally increased (Figure 65) with increasing F/M, however. Consequently, the total effluent BOD_5 increased with increased loading.

Correlation of sludge production in the secondary system with inverse F/M as attempted in Figure 66 is poor. The inverse of F/M (kg MLVSS·day/kg BOD_5 applied) is used since it should provide a straight line according to the relationship:

$$\text{kg TSS produced/kg } BOD_5 \text{ applied} = -b\ (\text{kg MLVSS·day/kg } BOD_5 \text{ applied}) + a$$

Oxygen consumption correlation with inverse F/M in a similar form in Figure 67 is somewhat better and shows the anticipated decrease in oxygen consumption per unit of BOD_5 removed at higher loadings. The fact that better correlation of sludge production with loading could not be shown is disappointing but is

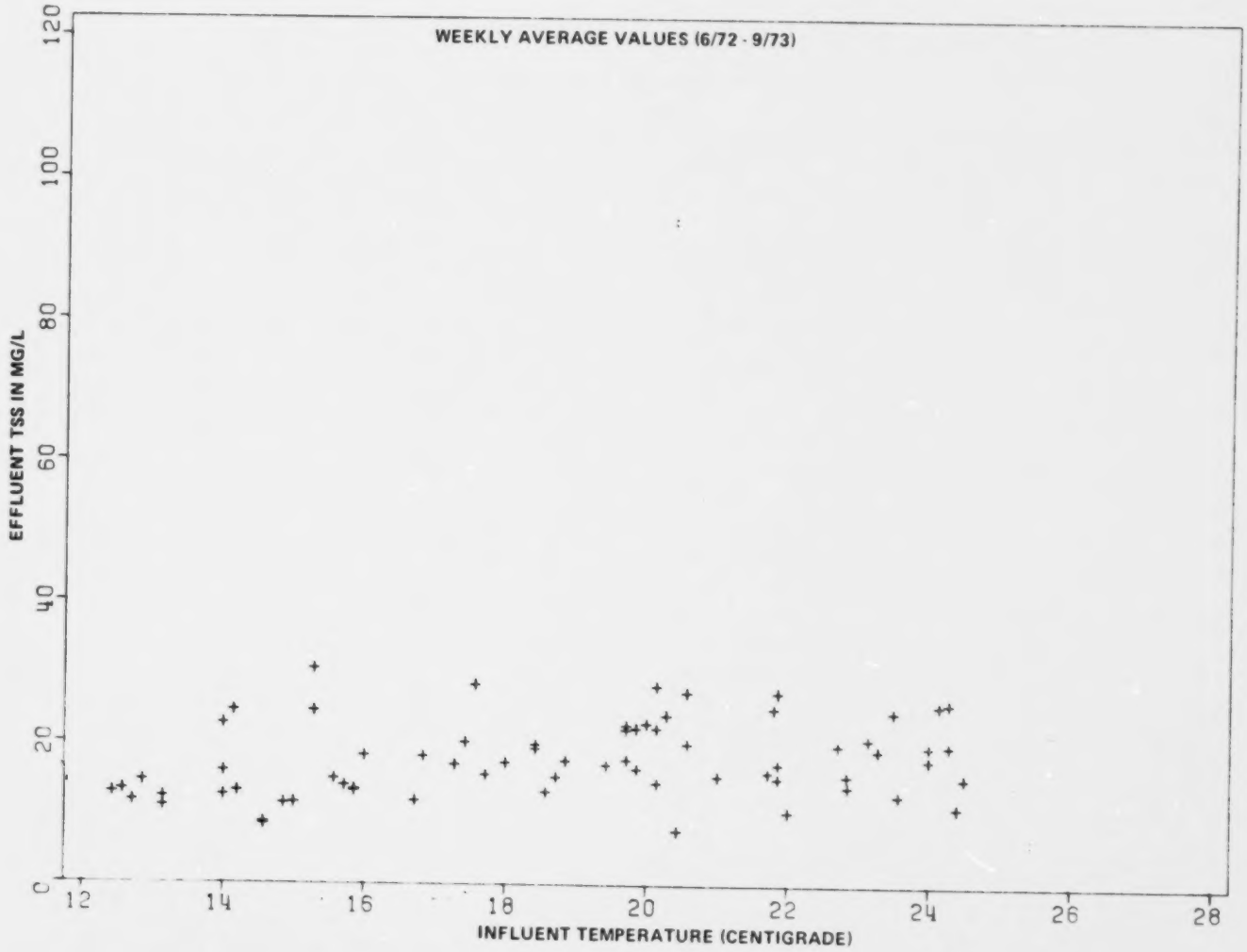


FIGURE 57. EFFLUENT TSS VERSUS INFLUENT TEMPERATURE

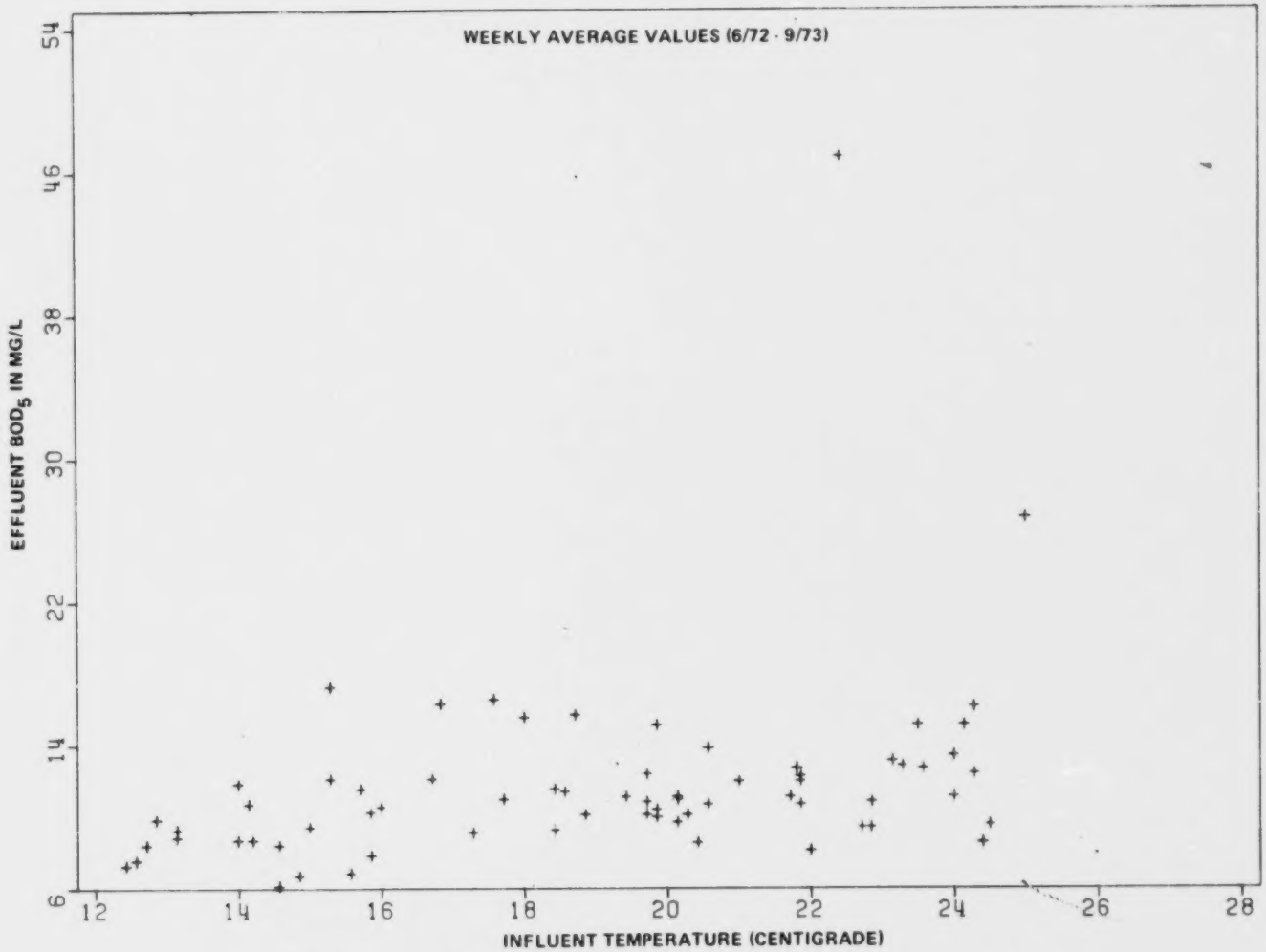


FIGURE 58. EFFLUENT BOD_5 VERSUS INFLUENT TEMPERATURE

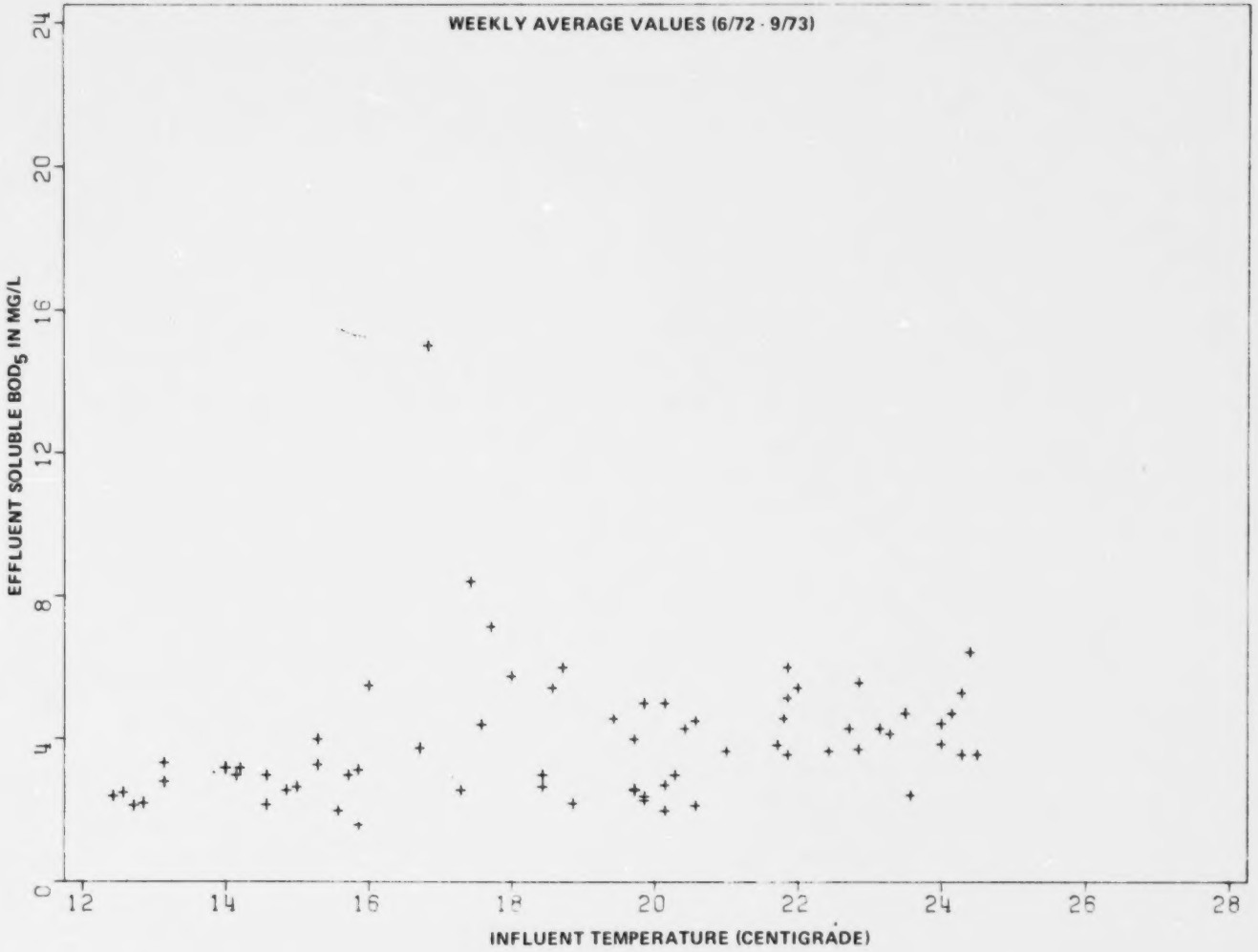


FIGURE 59. EFFLUENT SOLUBLE BOD_5 VERSUS INFLUENT TEMPERATURE

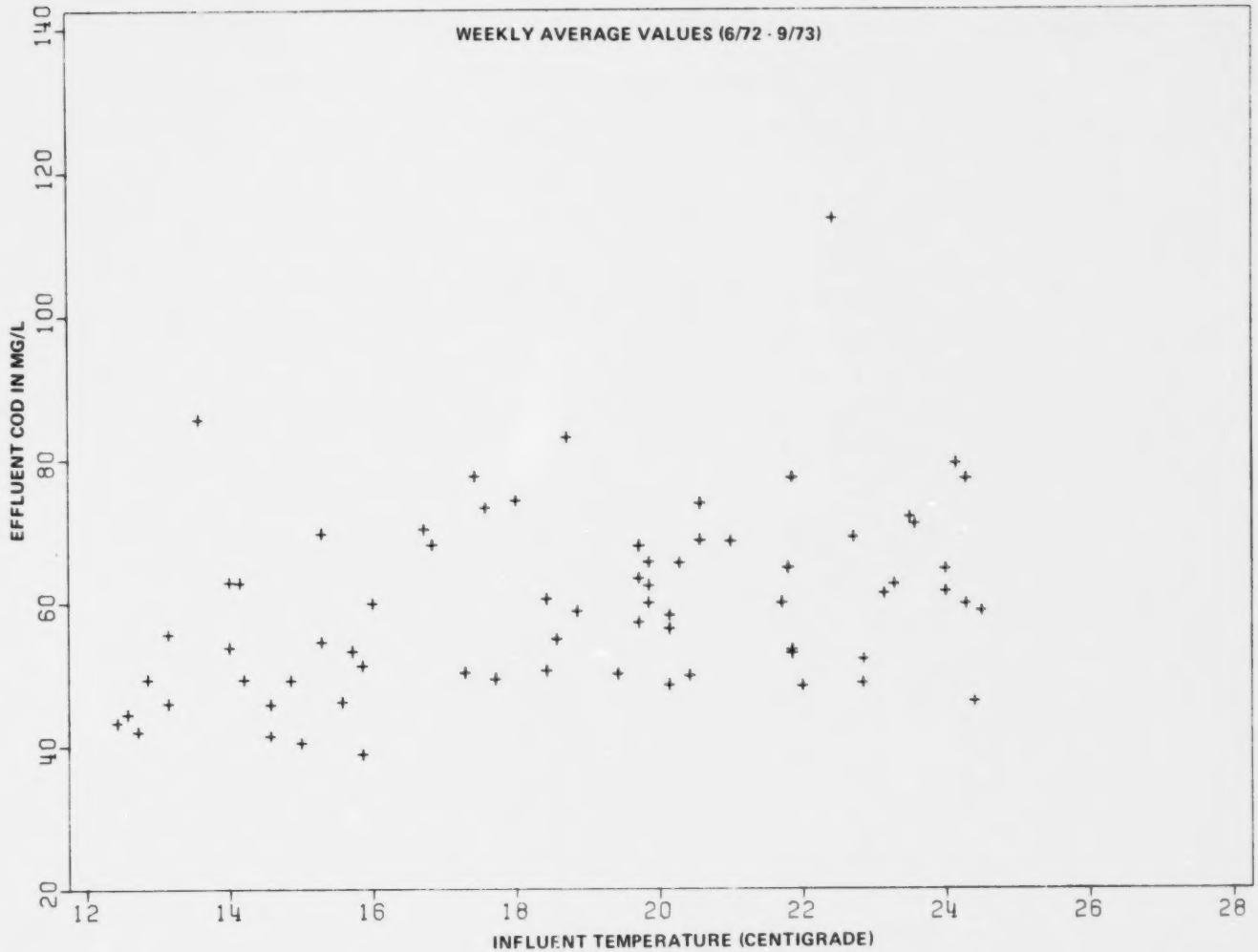


FIGURE 60. EFFLUENT COD VERSUS INFLUENT TEMPERATURE

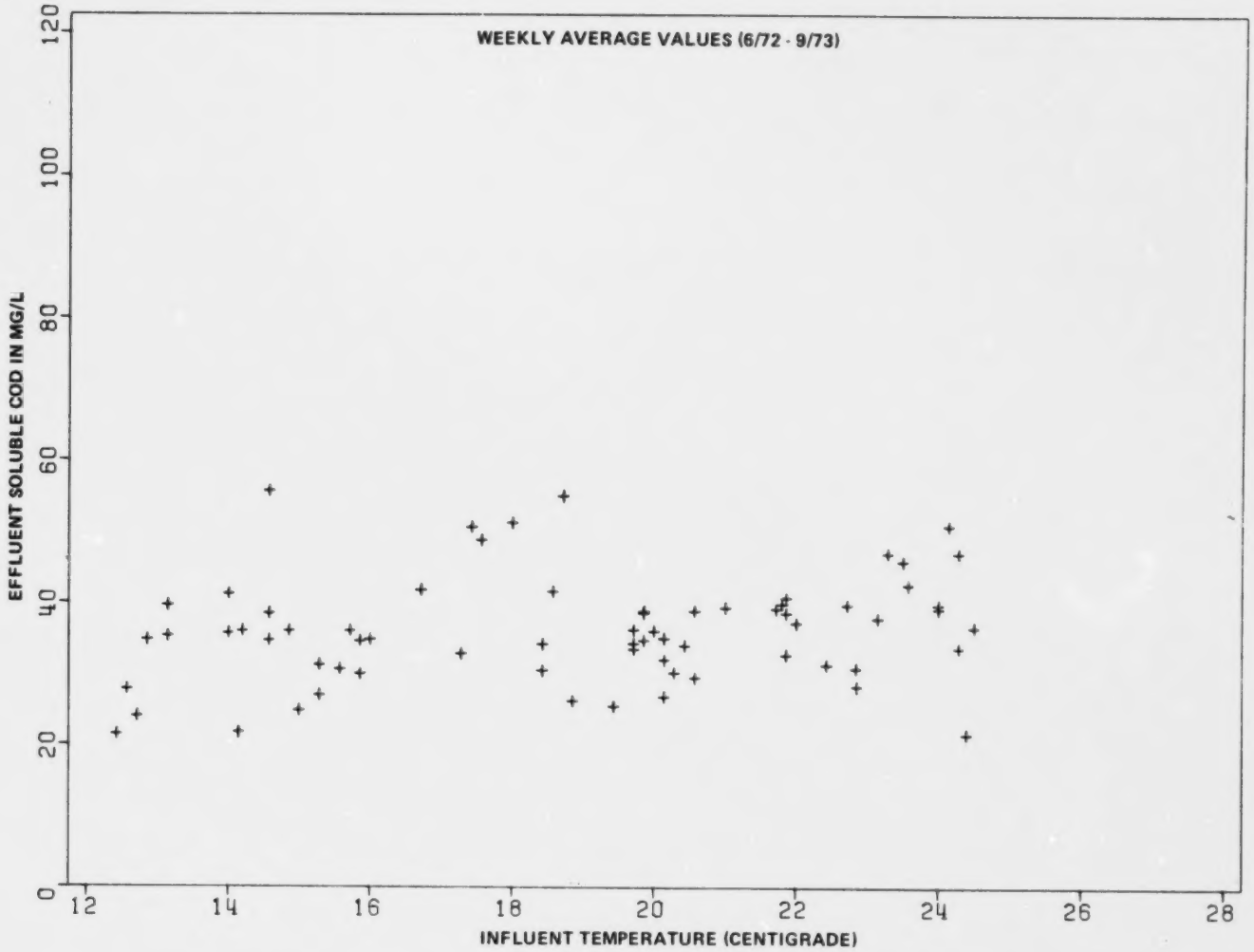


FIGURE 61. EFFLUENT SOLUBLE COD VERSUS INFLUENT TEMPERATURE

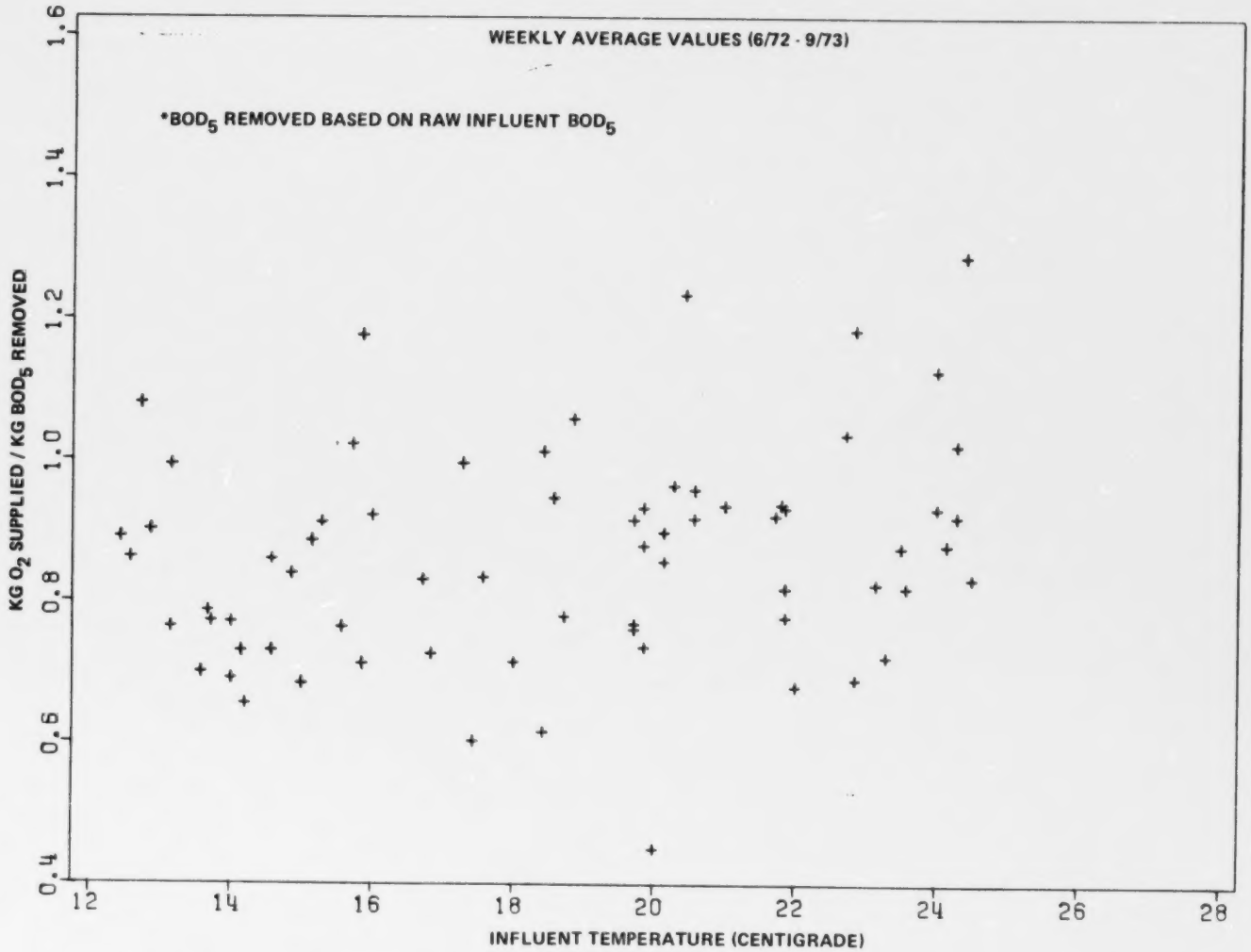


FIGURE 62. O_2 SUPPLIED/BOD_5 REMOVED* VERSUS INFLUENT TEMPERATURE

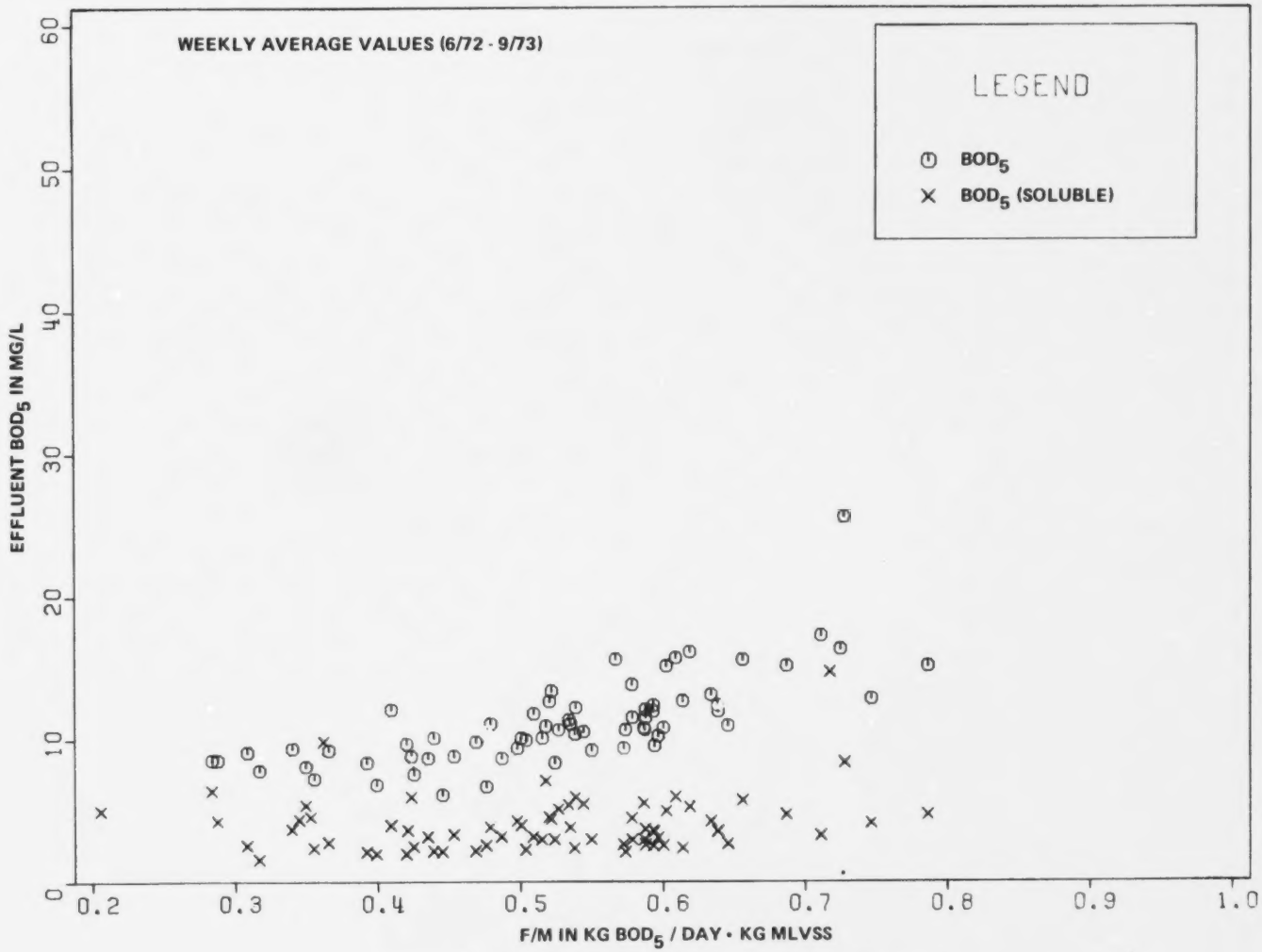


FIGURE 63. EFFLUENT BOD_5 VERSUS F/M

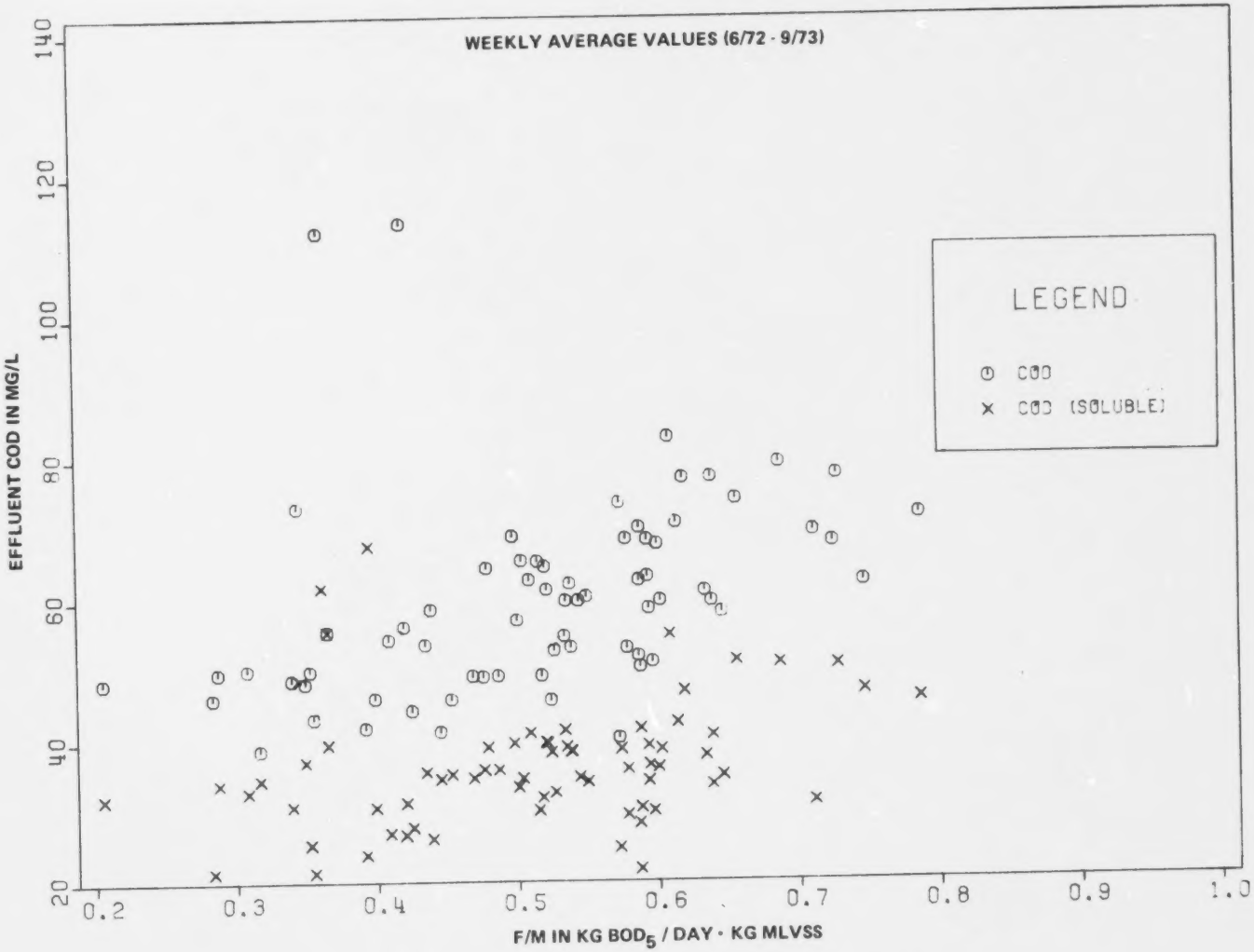


FIGURE 64. EFFLUENT COD VERSUS F/M

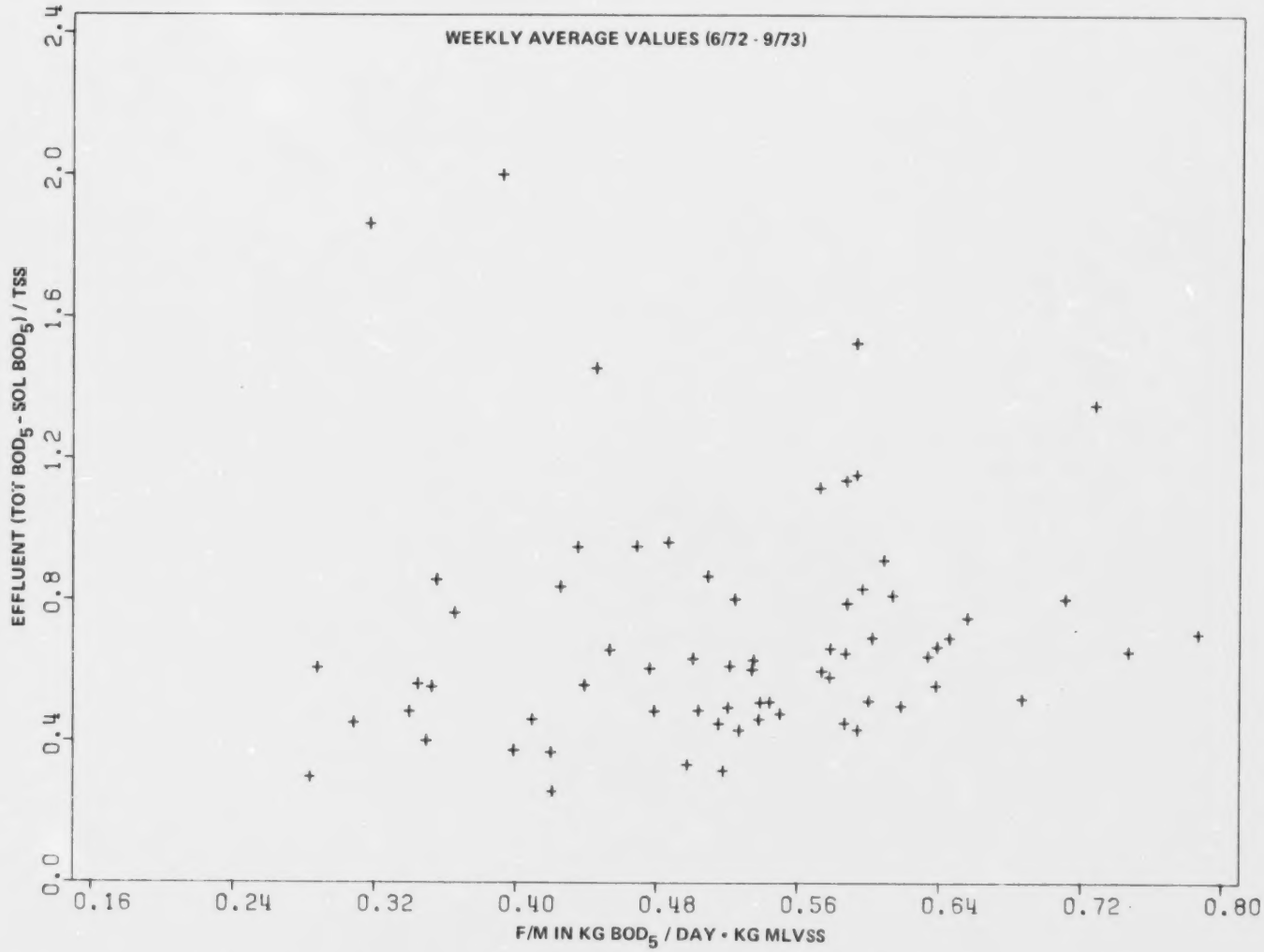


FIGURE 65. EFFLUENT (TOTAL BOD_5-SOLUBLE BOD_5)/TSS VERSUS F/M

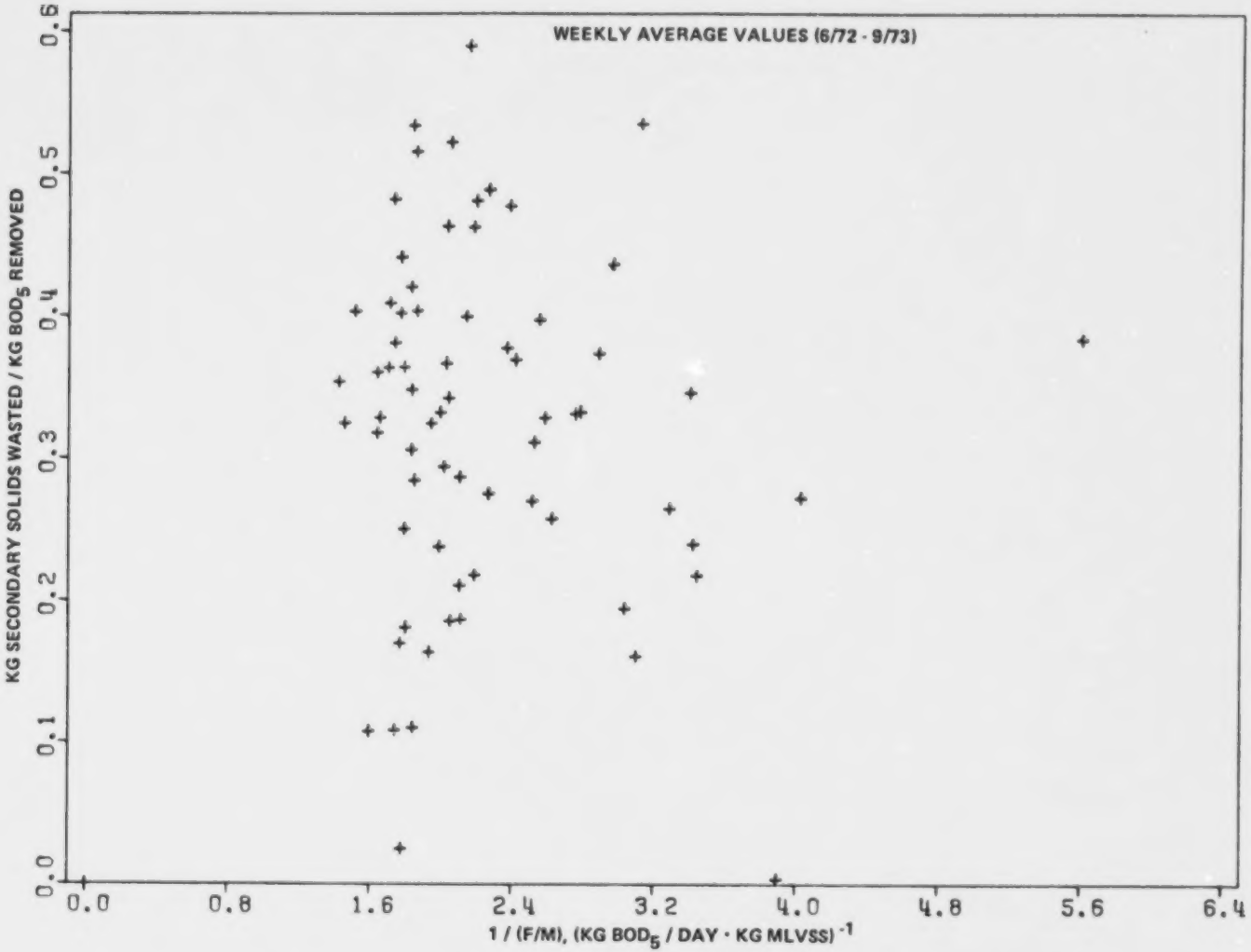


FIGURE 66. SECONDARY SOLIDS WASTED VERSUS 1/(F/M)

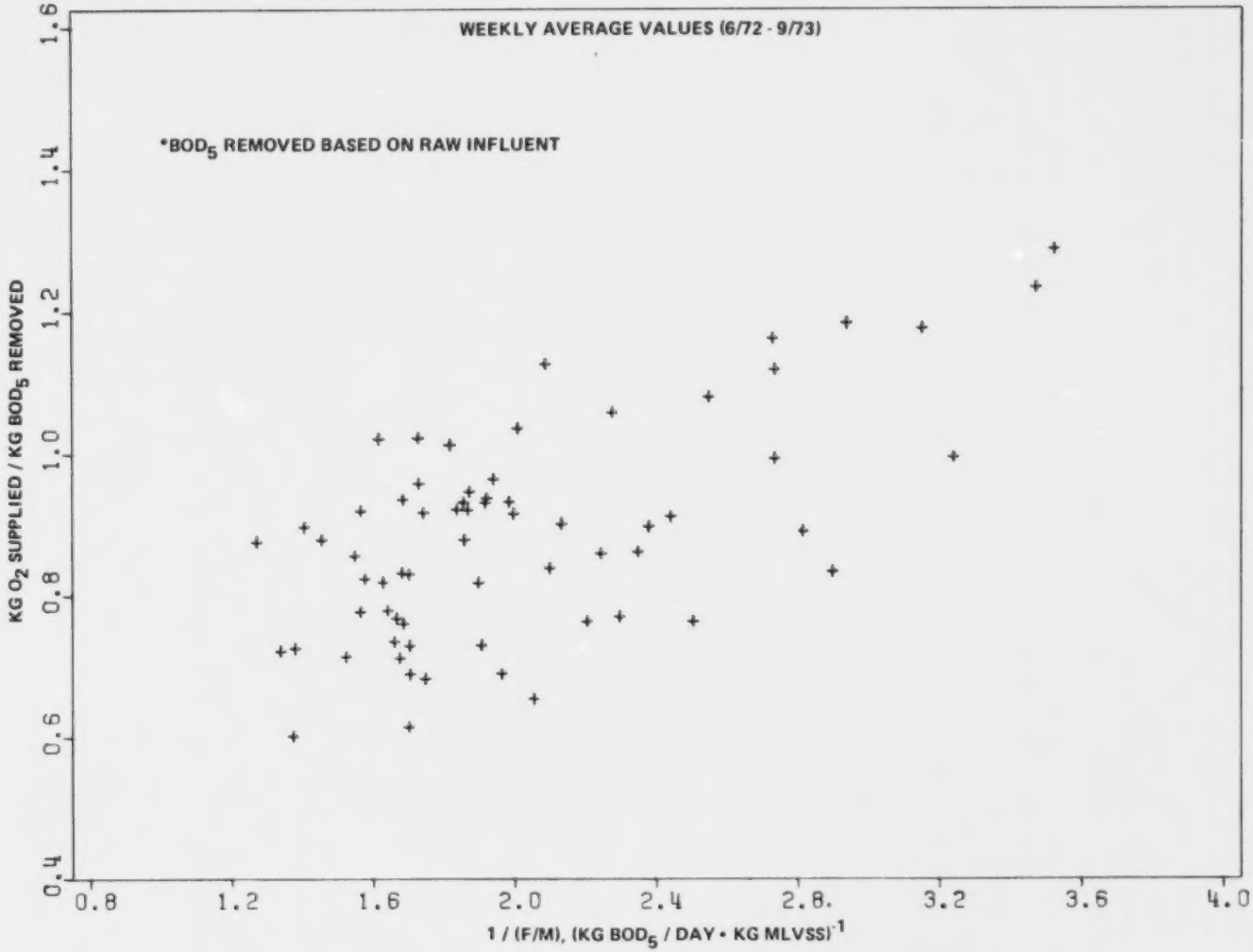


FIGURE 67. O_2 SUPPLIED/BOD_5^* REMOVED VERSUS 1/(F/M)

to be anticipated. The accurate control and measurement of solids inventories within operating plants is generally very difficult. Sludge wasting does not necessarily reflect the instantaneous BOD_5 loading on the plant, and a great deal of uncertainty is, therefore, introduced into the correlation of sludge production versus loading. The correlation of oxygen consumption per unit of BOD_5 removed with loading is, on the other hand, much better because the oxygen demand of the activated sludge system is closely tied to BOD_5 loading and the supply of oxygen to the process is automated.

The stability of the oxygen-activated sludge system, after stabilized operation was achieved in June of 1972, is readily apparent from the time plots contained in this section. Although the plant has a relatively consistent pumped influent loading, the operation was subjected to a number of different shocks or types of adverse conditions during 1972 and 1973. In summary, these included the following:

A. Hurricane Agnes (June 20, 1972) - low flows and process loadings for an extended period.

B. Extended Delay of Sludge Wasting (August 31 - September 3, 1972) - high solids residence time in the secondary clarifiers with deep sludge blankets.

C. Primary Clarifier Outage (November 25-29, 1972) - high process loadings and low reactor detention times.

D. Secondary Clarifier Outage (January 2-7, 1973) - high secondary clarifier overflows and bottoms loadings relative to design.

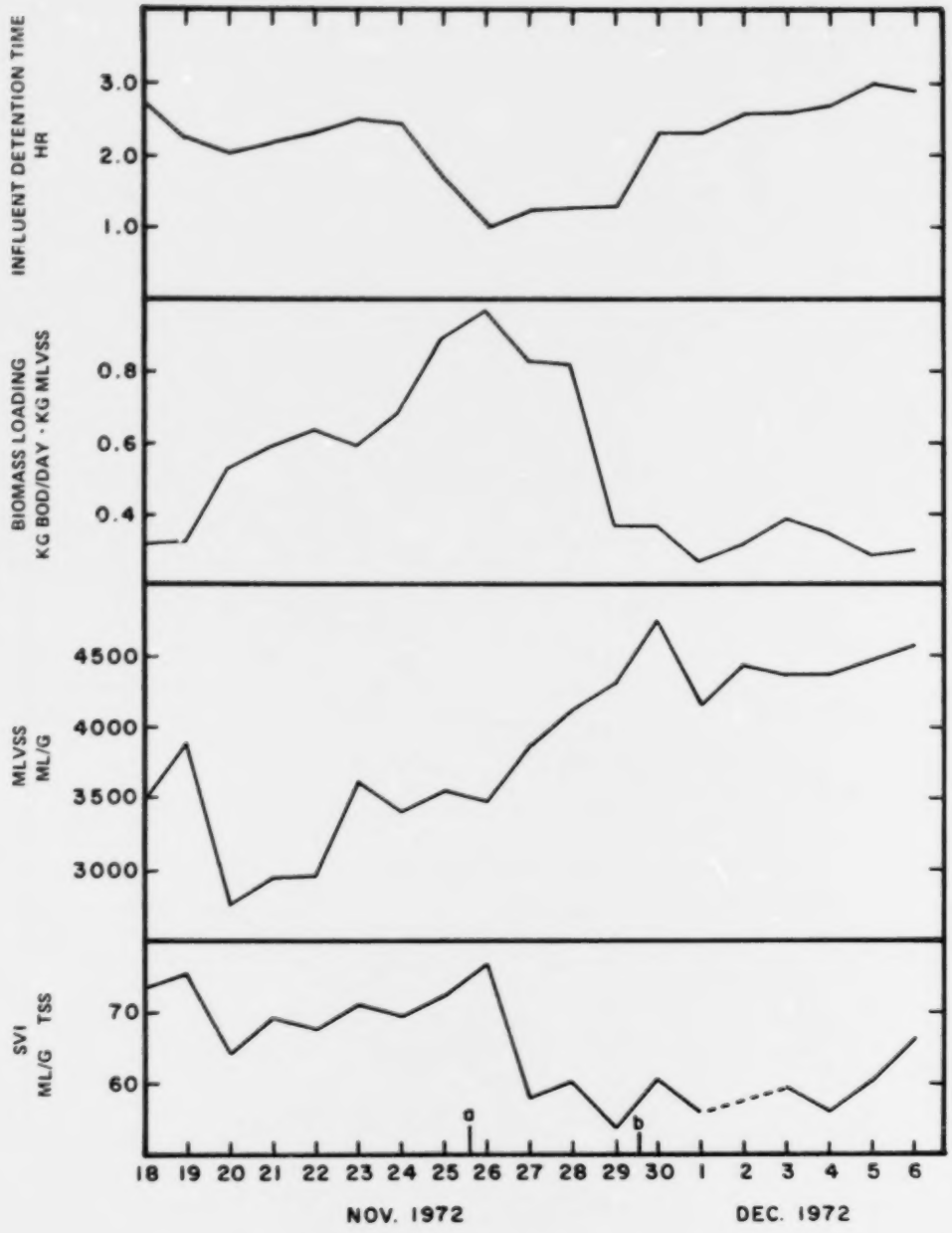
E. Heavy metals and toxic substances shock loading (late May 1973).

Rapid system recovery was effected under all of these conditions. This has been true in part due to the efforts of County personnel in operating the plant, but also to the inherent stability of the oxygen-activated sludge process.

Hurricane Agnes resulted in an extended period of extremely light loadings on the Westgate plant. One of the most obvious changes in the system associated with Agnes was the change in SVI. The SVI rose from circa 50 to a peak of 90 ml/g-TSS over a period of one month. The SVI stabilized for the duration of the Agnes recovery at approximately 75 to 80 and continually improved with increasing loading thereafter, or until June of 1973.

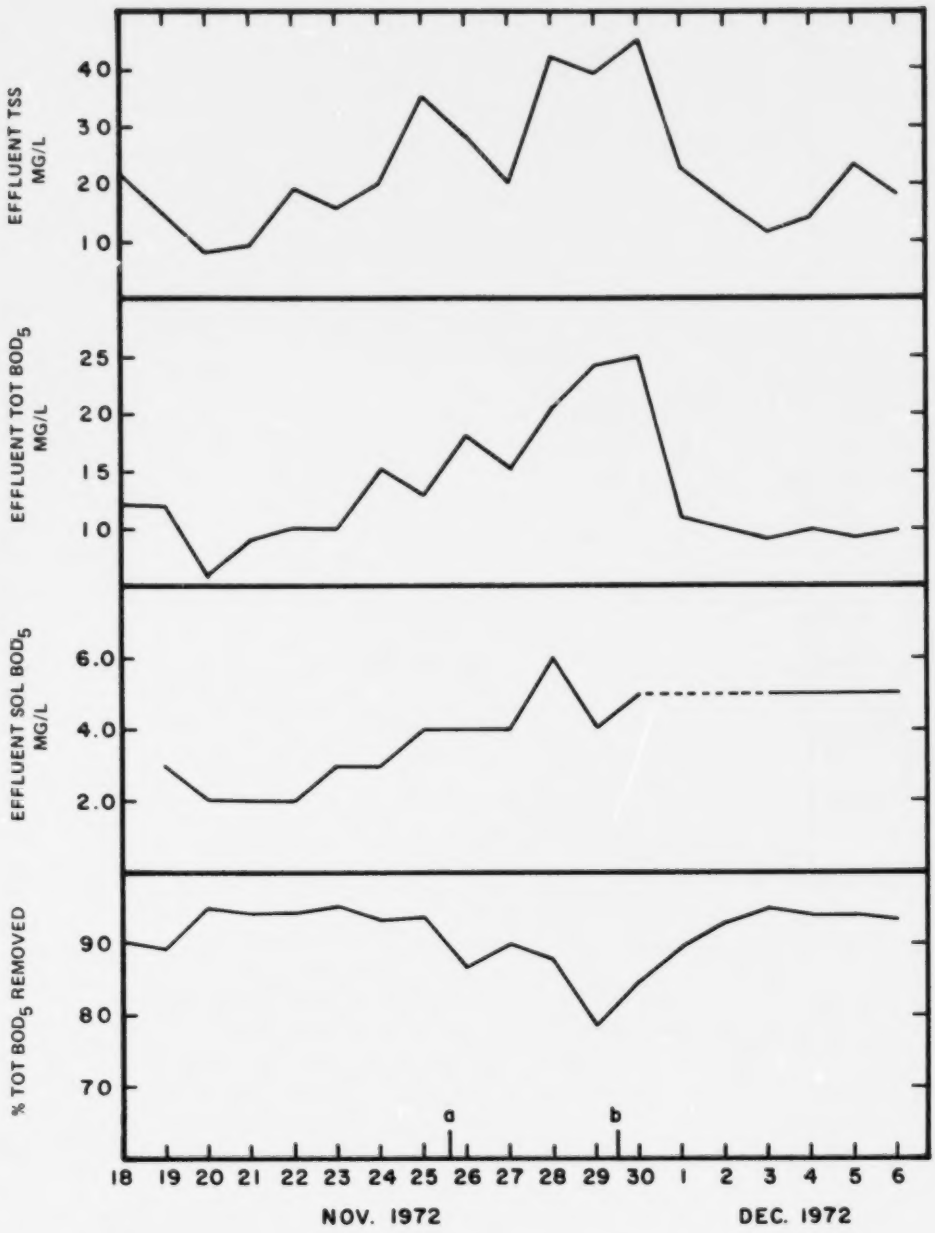
Other than SVI changes, the effects of Agnes can be seen in Figures 48 (Percent VSS), 54 (ZSV), 55 (O_2 Supplied/BOD_5 Removed), and 56 (Solids Wasted). While these operational parameters reflected the stresses of Agnes, it is obvious from Figures 39 through 43 that the average effluent quality did not deteriorate significantly.

Figures 68 and 69 illustrate the response and recovery of the oxygen-activated sludge system to primary (68) and secondary (69) clarifier failures while normal flows were maintained through the plant.



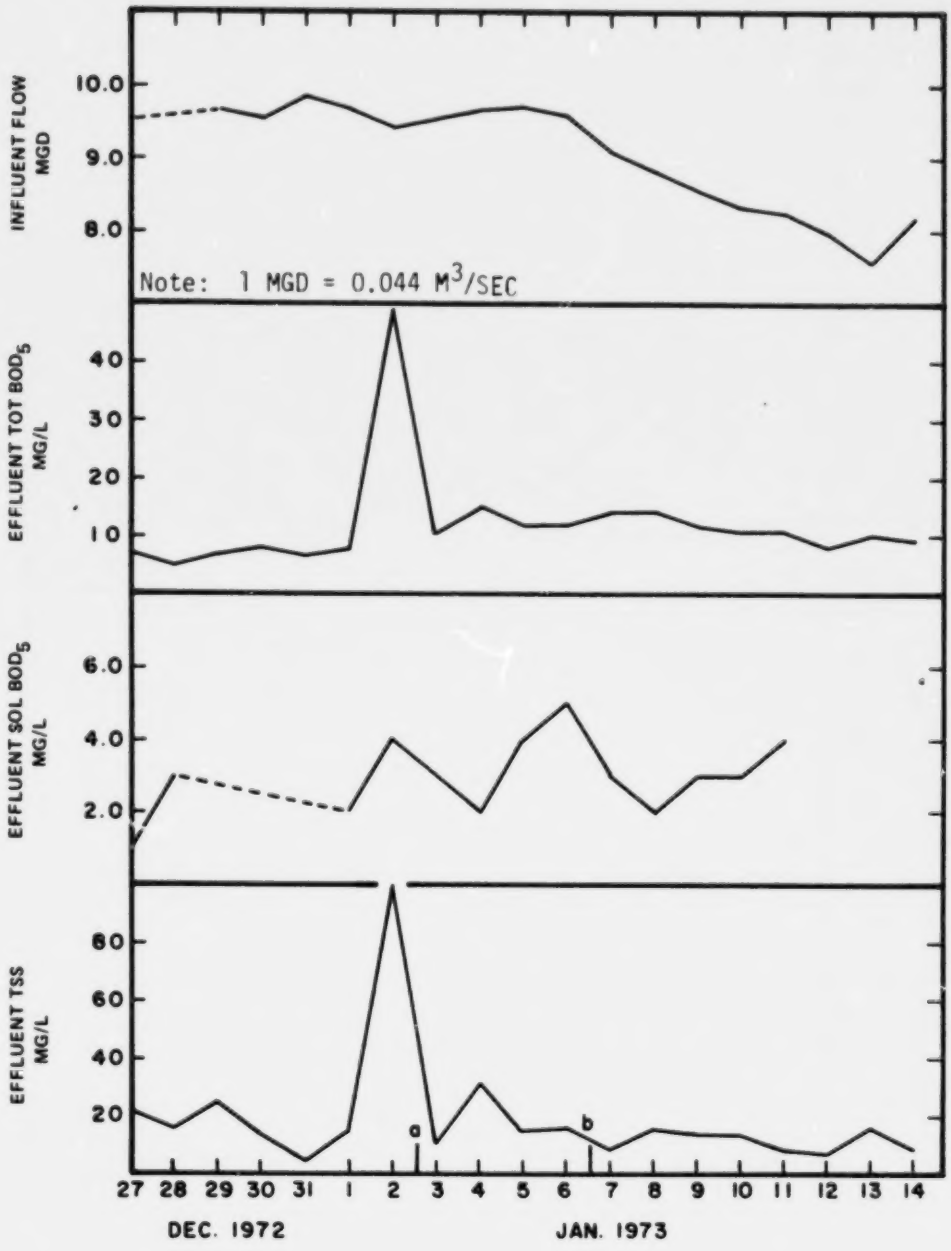
[a]ONE PRIMARY CLARIFIER DOWN FOR FLIGHT-CHAIN REPLACEMENT.
ONE OXYGENATION BASIN OUT OF SERVICE AT 1:30 P.M.
[b]BACK IN SERVICE AT 12:00 noon.

FIGURE 68. WESTGATE PLANT PERFORMANCE WITH ONE PRIMARY CLARIFIER AND ONE OXYGENATION BASIN OPERATIONAL



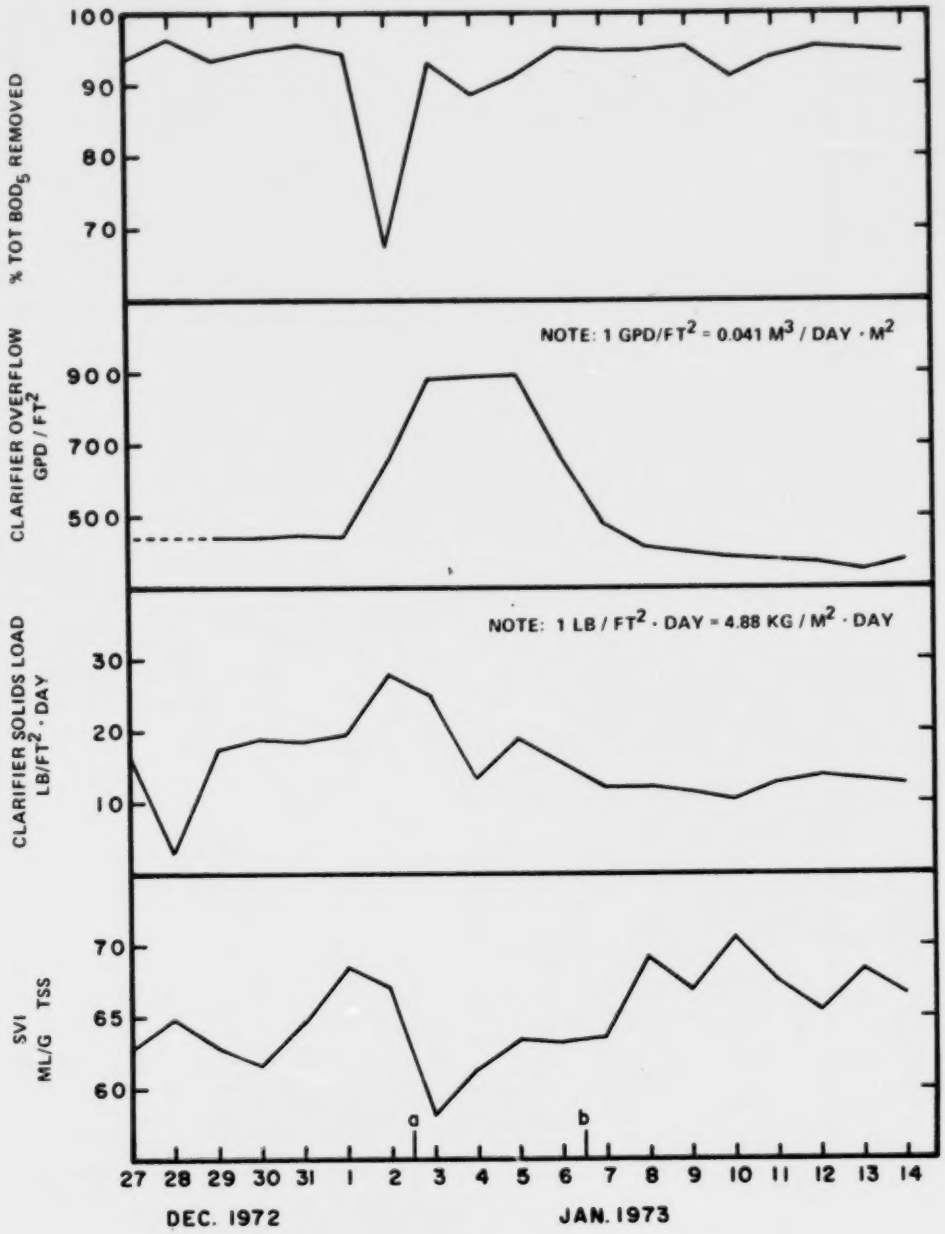
[a]ONE PRIMARY CLARIFIER DOWN FOR FLIGHT-CHAIN REPLACEMENT.
ONE OXYGENATION BASIN OUT OF SERVICE AT 1:30 P.M.
[b]BACK IN SERVICE AT 12:00 noon.

FIGURE 68. WESTGATE PLANT PERFORMANCE WITH ONE PRIMARY CLARIFIER AND ONE OXYGENATION BASIN OPERATIONAL (CONTINUED)



[a]ONE SECONDARY CLARIFIER DOWN AT 1:00 P.M. DUE TO BROKEN EFFLUENT LAUNDER.
[b]BACK IN SERVICE AT 1:10 P.M.

FIGURE 69. WESTGATE PLANT PERFORMANCE WITH ONE SECONDARY CLARIFIER OPERATIONAL



[a]ONE SECONDARY CLARIFIER DOWN AT 1:00 P.M. DUE TO BROKEN EFFLUENT LAUNDER.
[b]BACK IN SERVICE AT 1:10 P.M.

FIGURE 69. WESTGATE PLANT PERFORMANCE WITH ONE SECONDARY CLARIFIER OPERATIONAL (CONTINUED)

Primary clarifier failure necessitated shutdown of one complete train (except for that train's secondary clarifier) of the system, thus forcing the complete plant flow through the second train. Secondary clarifier failure, which was caused by a broken skimmer, resulted in full plant flow through one secondary clarifier yielding high average overflow rates relative to design.

The plot of sludge blanket depth for both secondary clarifiers in Figure 52 indicates the problems associated with sludge handling at Westgate. Periodically, the breakdown of sludge handling equipment prevented the wasting of excess activated sludge on a routine basis. Sludge subsequently accumulated in the secondary clarifiers and sludge blanket depths varied substantially causing, in some isolated instances, a loss of solids to the effluent either by sludge blanket overflow or floating sludge.

Plant BOD_5 removal efficiencies based on raw influent BOD_5 are presented in the form of probability of occurrence plots in Figure 70.[5] These data indicate average removal efficiencies of 95 percent and 92.5 percent based on total influent versus soluble and total effluent BOD_5, respectively. Figure 70 reflects the operating period from June 1972 through September 1973 and excludes startup and optimization operations.

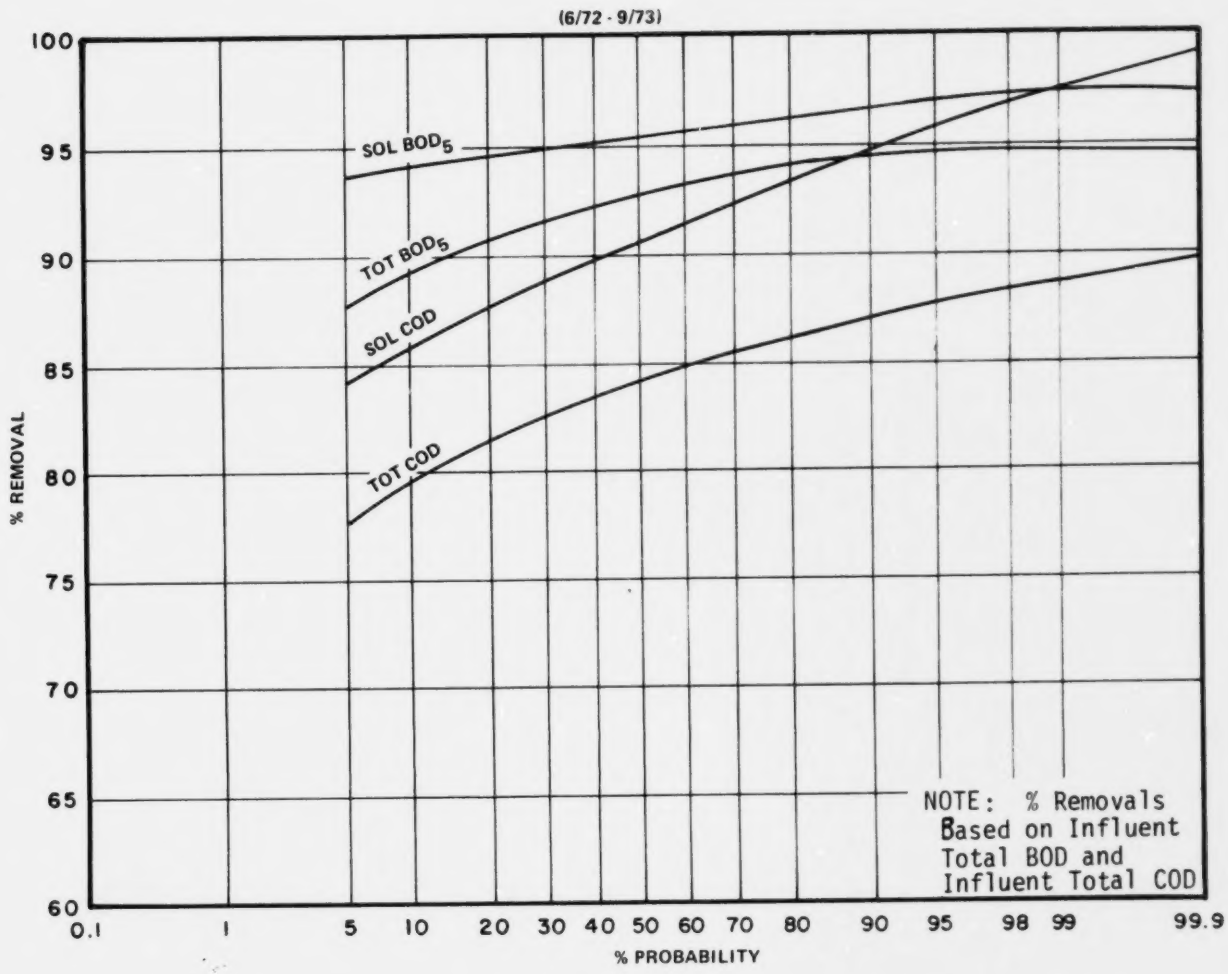


FIGURE 70. PROBABILITY OF OCCURENCE OF TOTAL PLANT REMOVAL OF TOTAL COD, SOLUBLE COD, TOTAL BOD_5, AND SOLUBLE BOD_5

SECTION IX

PERFORMANCE EVALUATION

The OASES[R] system at Westgate demonstrated over the two-year period covered in this report the stable and highly reliable performance which characterizes oxygen-activated sludge systems. BOD_5 removal efficiencies exceeded required values and anticipated levels as summarized in Table 8. The high removal efficiencies may have been due in part to somewhat lower average influent flow and strength than were called for in the original design specifications. Figure 63 indicates, however, that the plant maintained excellent weekly average effluent values over the relatively broad range of biomass loadings of 0.2 to 0.8 kg BOD_5/day·kg MLVSS (lb/day·lb).

TABLE 8. BID PERFORMANCE SPECIFICATIONS VERSUS ACTUAL PLANT PERFORMANCE

Item	Specification Requirements	Actual[(a)] Average Data	Anticipated[(b)] Performance
Influent Flow, mgd	14	11-12	14
Influent BOD, mg/l	220	150-180	220
Total BOD_5 Removed, %	80	92	87
O_2 Supplied, tons/day	-	5-7	9.3-9.9
O_2 Supplied/BOD_5 Removed, kg/kg	-	0.69-0.96[(c)]	0.83-0.89

(a)Excludes startup and optimization operating data.
(b)At anticipated average design loading.
(c)Based on an average influent flow of 11.5 mgd and an average influent BOD_5 of 165 mg/l.

Note: 1 mgd = 0.044 m^3/day
1 ton/day = 907 kg/day

Acclimatization of biomass over a long period of time may play an important role in achieving somewhat higher BOD_5 removal efficiencies than anticipated. Long term acclimatization in the form of continuously decreasing soluble BOD_5 can be seen in the data presented in Figure 40. This plot reflects a period of continuous process performance improvement of 12 months before the

lowest effluent soluble BOD_5 values were achieved. The trends in Figures 39 and 40 reflect, as well, a period of adjustment in achieving integrated operation of the oxygen-activated sludge system and the plant as a whole including sludge handling.

Oxygen requirements originally estimated for the Westgate plant at average design loading were high relative to those actually experienced. While a requirement of approximately 8,160-9,070 kg (9-10 tons) oxygen/day was anticipated, actual oxygen requirements have ranged only from 4,540-6,350 kg (5-7 tons)/day. This again reflects flows and BOD_5 strengths somewhat below those anticipated in the design specifications. Variation in the amount of oxygen required per unit of BOD_5 removed as a function of season has been minimal as shown in Figures 55 and 62.

Sludge production data obtained at Westgate have been clouded to some extent by the integral nature of the primary clarifiers and oxygenation basin. The primary effluent enters the oxygenation basin through submerged portals in a common wall between them. This has made it impossible to obtain samples of primary effluent on a routine basis. Consequently, all oxygenation basin influent data in this report are based on raw wastewater characteristics.

The usefulness of reporting data for Westgate on the basis of raw influent characteristics rather than primary effluent was studied during the startup optimization program. An intensive monitoring effort over a two-week period was undertaken to determine the effects of the primary clarifiers on the characteristics of the raw wastewater. Diurnal samples were collected at the submerged primary effluent portals and the raw influent channel. The results of this study are shown in Table 9. It is apparent that the primary clarifier did not significantly affect the influent total BOD_5 and COD while soluble BOD_5 and COD values increased slightly. The solids levels varied across the primary, but again not to a significant extent.

The apparent lack of change in influent characteristics across the primary was not surprising considering the short 15 min residence time. The results indicated, therefore, that in terms of BOD_5 the use of raw influent values for data analysis was permissible. There is an inconsistancy in the use of raw influent data as input to the oxygenation basin in that there are significant quantities of primary sludge produced on a daily basis at Westgate. The source of these solids must be the influent stream, and it must be assumed that the influent stream was not homogeneously mixed across the channel and, therefore, heavier solids may have been missed in sampling. To further complicate analysis of the sludge production picture, the quantity of primary sludge wasted is not accurately recorded, but only estimated based on secondary solids wasting and total solids wasting data.

Extensive mass balance determinations relative to sludge production have not been done at Westgate because of the above uncertainties. During the optimization program, when a substantial effort was made to measure sludge production, a total (primary plus secondary) average sludge production rate of 0.76 kg TSS/kg BOD_5 removed (lb/lb) was estimated. A total dry weight of

TABLE 9. PRIMARY CLARIFIER PERFORMANCE ANALYSIS

Time	Influent Flow, mgd	Raw Influent, mg/l					#1 Primary Effluent, mg/l[a]					#2 Primary Effluent, mg/l[b]				
		COD Unfil	COD Fil	BOD_5 Unfil	BOD_5 Fil	TSS	COD Unfil	COD Fil	BOD_5 Unfil	BOD_5 Fil	TSS	COD Unfil	COD Fil	BOD_5 Unfil	BOD_5 Fil	TSS
12 M	10.0	306	63	153	30	168	314	128	153	74	164	307	111	144	71	156
1 AM	8.9	277	62	144	20	156	251	116	120	63	132	257	112	141	57	186
2 AM	8.3	204	64	123	24	136	269	87	82	46	100	212	79	117	42	110
3 AM	8.1	197	39	84	23	86	180	67	63	21	94	151	64	90	36	100
4 AM	7.8	151	43	72	17	102	149	35	55	17	94	137	48	78	32	88
5 AM	7.6	146	39	99	20	74	121	41	30	4	72	89	37	57	17	74
6 AM	8.0	88	47	90	18	60	87	30	24	4	82	80	41	45	17	26
7 AM	10.0	123	46	96	20	82	100	28	33	6	82	129	25	45	17	34
8 AM	10.6	169	39	90	24	126	135	48	51	13	104	170	50	63	21	38
9 AM	10.4	216	41	126	27	122	383	55	84	23	168	177	49	87	32	96
10 AM	9.9	284	58	108	24	150	205	65	90	37	166	277	66	90	36	74
11 AM	9.7	277	90	150	39	154	264	84	126	48	200	233	81	111	42	112
12 N	9.6	321	66	150	26	196	263	89	144	59	196	255	95	123	51	112
1 PM	9.5	358	105	171	33	192	299	102	135	62	212	284	106	162	59	164
2 PM	9.4	328	97	153	45	202	334	97	177	63	292	335	128	150	66	170
3 PM	9.4	317	82	132	35	232	316	102	168	63	214	295	154	138	86	138
4 PM	9.5	312	90	135	38	218	314	104	153	52	230	280	120	153	59	150
5 PM	9.7	340	93	144	56	164	361	152	178	78	180	305	153	153	90	124
6 PM	10.4	304	85	132	45	200	343	104	172	56	172	347	90	165	69	130
7 PM	10.7	404	85	171	44	246	461	163	219	84	356	377	130	189	65	252
8 PM	10.9	349	74	162	56	224	390	133	162	75	226	382	115	156	77	168
9 PM	11.2	392	91	189	65	274	295	163	160	99	154	365	143	183	90	152
10 PM	10.9	390	120	177	72	188	377	129	216	93	204	425	154	167	87	162
11 PM	10.1	363	92	174	54	200	434	159	205	112	230	385	130	131	63	192
$\bar{X}$[c]	9.6	276	71	134	36	165	277	95	125	52	172	261	95	122	53	125
$\pm$	1.0	92	24	33	16	58	106	43	61	31	70	99	40	44	24	54
$\bar{X}_1$[d]		282	72	137	37	169	283	98	129	54	176	268	97	125	55	127

Note: 1 mgd = 0.044 m^3/sec

(a)Effluent samples at entry into "A" train.
(b)Effluent sampled at entry into "D" train.
(c)Arithmetic average $(\bar{X})$ and standard deviation $(\pm\ )$ of all samples weighted equally.
(d)Arithmetic average $(\bar{X})_1$ of all samples weighted according to flow rate - effective composite of 24 hours.

sludge ranging from approximately 4,500 to 10,400 kg (10,000 to 23,000 lb)/day is wasted on a monthly average basis (Appendix B) from the Westgate treatment plant and hauled to landfill in dumpsters.

The secondary sludge production rate measured during the optimization program was 0.33 kg VSS/kg BOD_5 removed (lb/lb) or 0.42 kg TSS/kg BOD_5 removed (lb/lb) at 78 percent volatility. In view of previous discussions related to data scatter when attempting to correlate sludge production with biomass loading (Figure 66), the following simple data analysis was used to confirm these figures. The mass of secondary TSS wasted per day was estimated on the basis of recycle sludge concentration and the volume of secondary sludge wasted per day and plotted against BOD_5 removed per day in Figure 71. A line constructed through the origin with a slope of 0.42 appears to bisect the mass of data points in Figure 71. This tends to confirm 0.33 kg VSS/kg BOD_5 removed (lb/lb) as an average number since the percent volatility has not changed appreciably over the period of operation with the exception of the Agnes episode in June and July of 1972.

Sludge properties at Westgate in terms of SVI and ZSV have been good. Observed SVI values trend toward higher numbers at lower F/M's (Figure 72), but scatter makes further correlation of SVI and F/M difficult. ZSV values were obtained routinely by Westgate personnel using one-liter cylinders without the stirrers which normally operate at 6 rph and prevent bridging. Settling velocities followed the expected trends as a function of MLSS concentration, ranging, on the average, from a high of about 2.6 m/hr (8.5 ft/hr) at 3000 mg/l to a low of about 1.1 m/hr (3.5 ft/hr) at 6000 mg/l. The data as bracketed by lines with a slope similar to those reported in the literature (8) for oxygen-activated sludges are illustrated in Figure 73. It is quite probable that if the slow stirrers had been used in the one-liter settling tests, or if the larger 2.4 m x 0.15 m (8 ft x 6 in) column had been routinely employed, the ZSV's recorded would have been considerably higher.

Recycle sludge underflow concentrations initially ranged from 2.1 to 3.0 percent solids but stabilized with extended plant operations at 1.6 to 2.0 percent as indicated in Figure 74. A cross-check of the mass balances around the oxygenation tank, i.e., the MLSS and underflow solids concentrations relative to influent flow rates and recycle flow rates, indicates that the recycle flows, measured in a Dog Tube (Venturi) type flowmeter equipped with a clean water purge system, were in error. Problems were encountered with the meter electronic digital readout and corrosion in the pressure regulators on the clean water purge system. Assuming that the measured influent flow rates and MLSS and underflow solids concentrations were correct, calculations indicate that the measured recycle flow rates as shown in Figure 49 may have been as much as 50 percent lower than the true values.

The thickening properties of the oxygen-activated sludge were excellent as previously discussed in Section VII (see Figure 28). The elimination of intermediate sludge thickening in the flotation thickeners in favor or decanting the sludge in a holding basin led to considerable savings in sludge

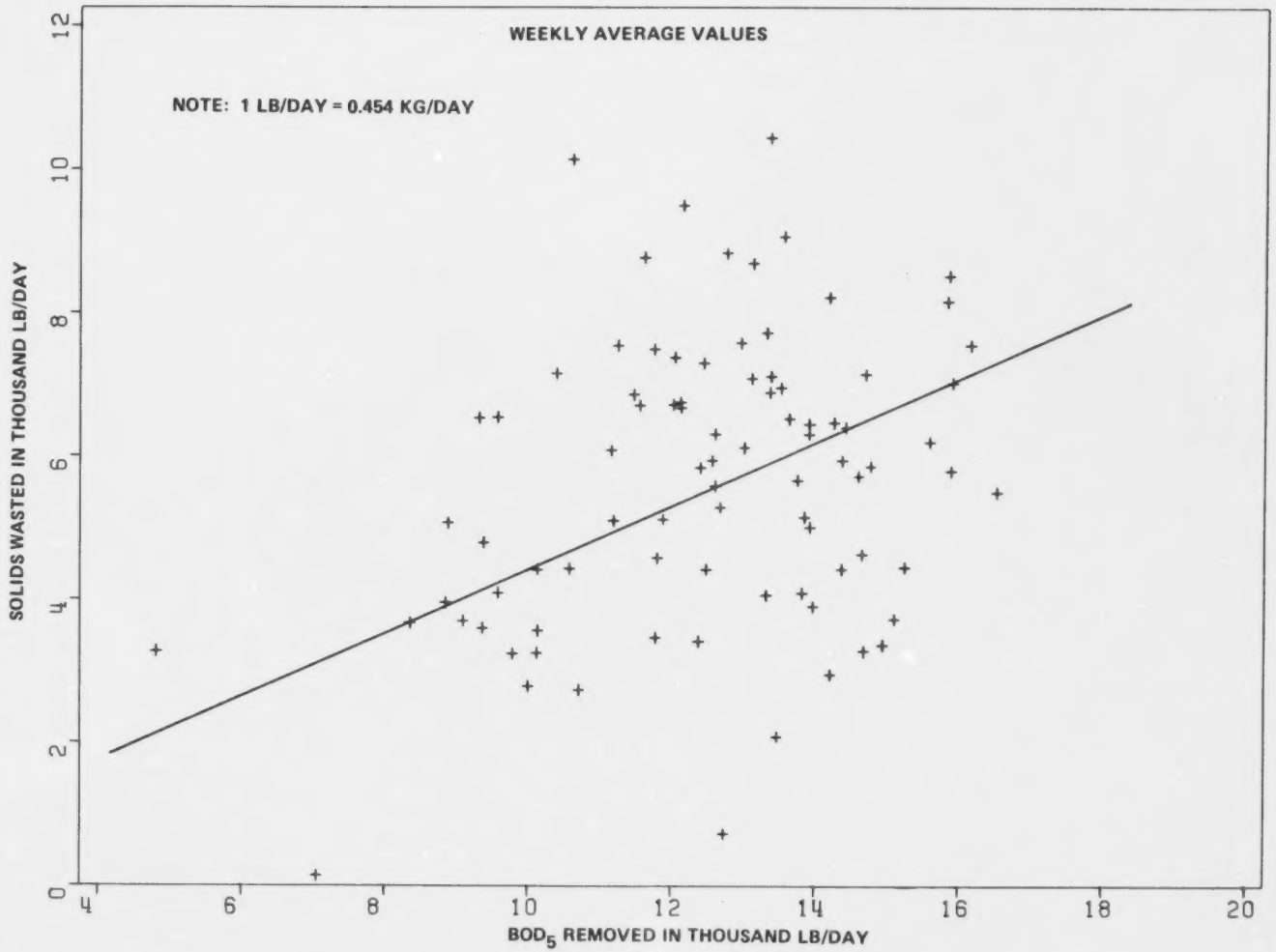


FIGURE 71. SECONDARY SOLIDS WASTED VERSUS BOD_5 REMOVED

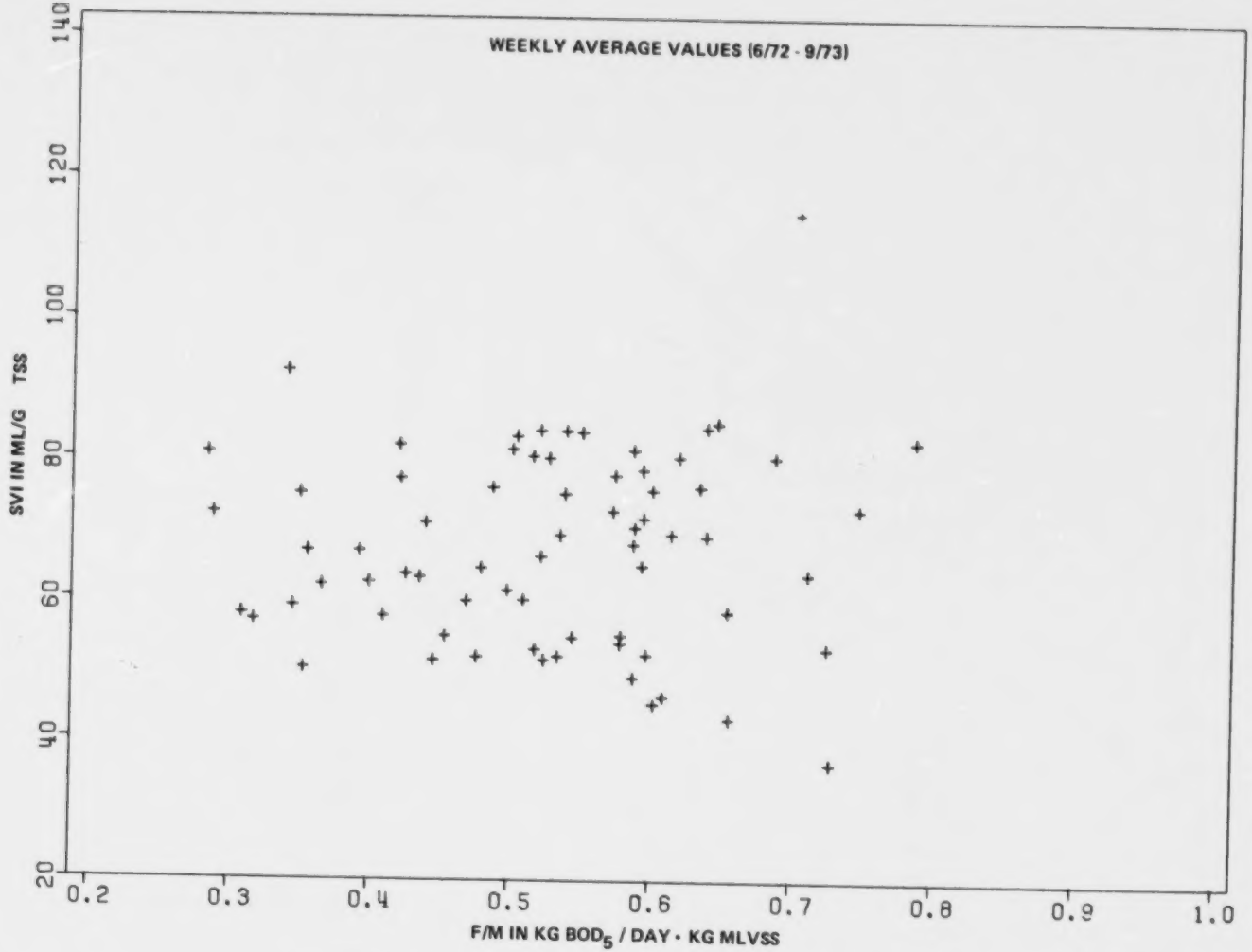
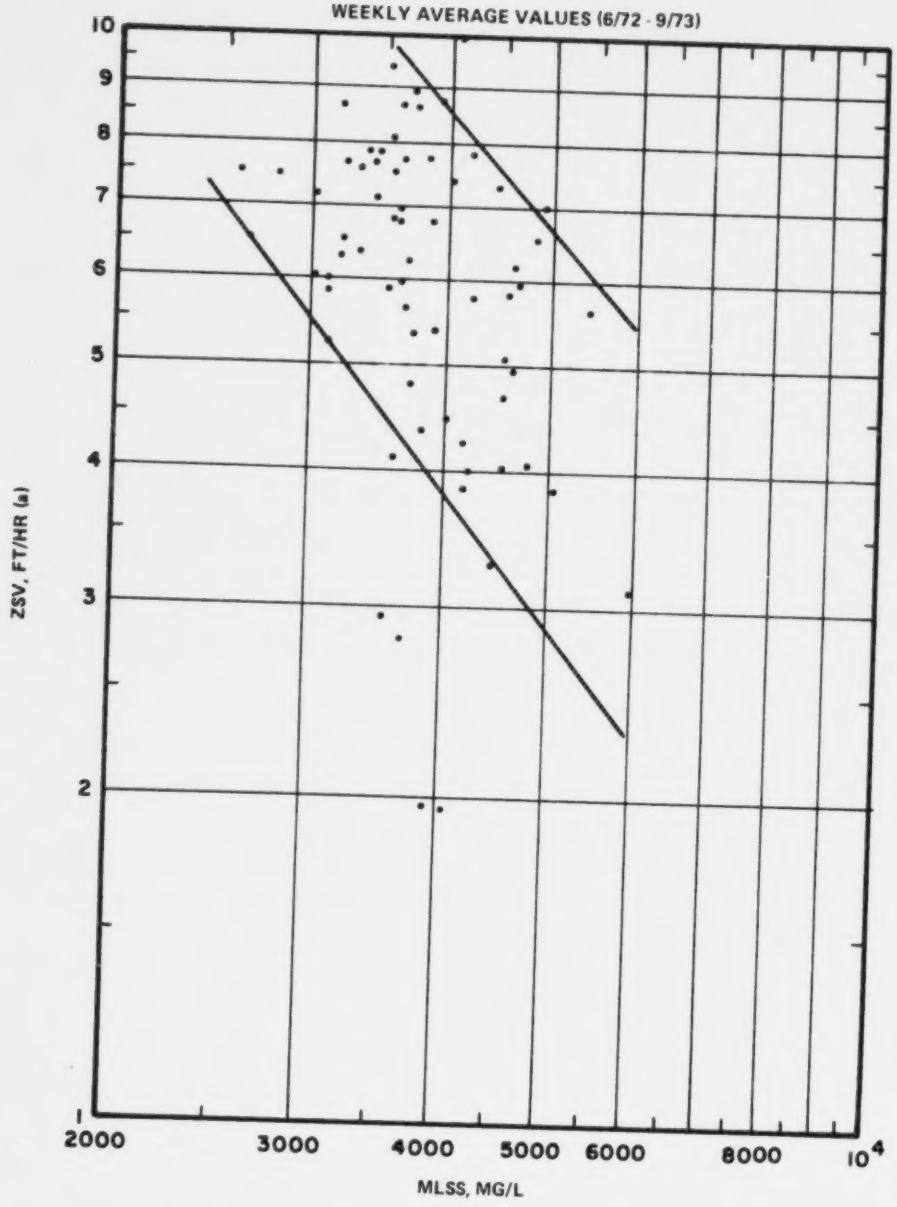


FIGURE 72. SLUDGE VOLUME INDEX VERSUS F/M



(a) THESE ZSV VALUES WERE DETERMINED IN AN UNSTIRRED ONE – LITER GRADUATED CYLINDER.

FIGURE 73. ZONE SETTLING VELOCITY VERSUS MIXED LIQUOR SUSPENDED SOLIDS

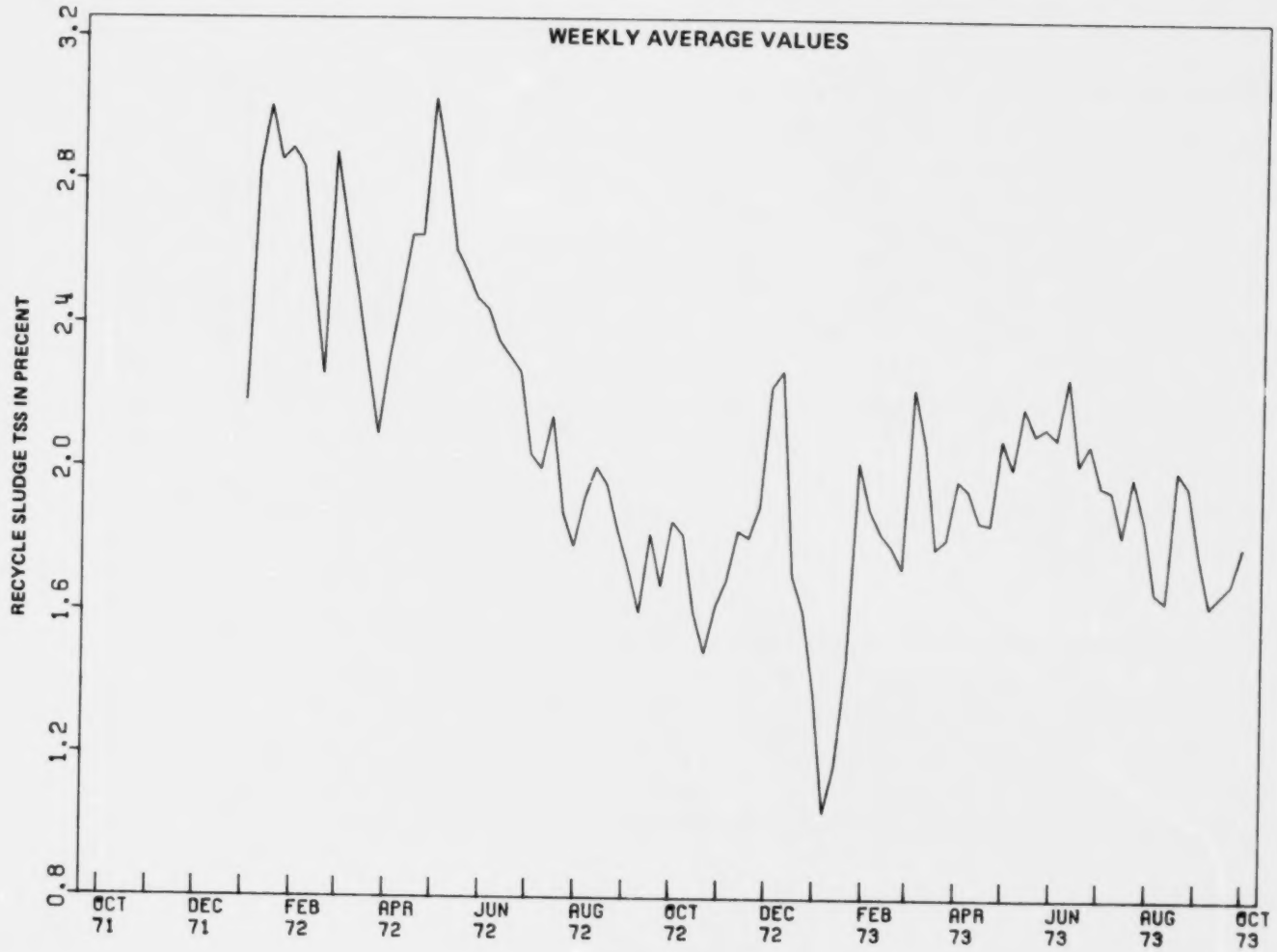


FIGURE 74. RECYCLE SLUDGE TOTAL SUSPENDED SOLIDS

handling costs. At present, waste oxygen-activated sludge is mixed with a cationic polyelectrolyte prior to decanting in a small holding tank. The decanted sludge is then mixed with primary sludge in varying percentages and filtered on the two original equipment vacuum coil filters.

The filterability of the waste oxygen-activated sludge after decanting and combining with primary waste sludge was excellent without chemical conditioning as previously discussed in Section VII. However, as also previously noted, to minimize odors and prevent further dewatering during transit to landfill, the combined sludges at Fairfax were treated with chemicals prior to filtration. The expected filter yield from vacuum filtration of primary plus waste air-activated sludge with 3.5 percent solids in the filter feed is about 10.3 $kg/m^2 \cdot hr$ (2.1 $lb/ft^2 \cdot hr$) (9). At Westgate, a filter feed made up of primary sludge plus waste oxygen-activated sludge and containing at least 6 percent solids produced an average filter yield over the 24 months of October 1971 through September 1973 of 21.5 $kg/m^2 \cdot hr$ (4.4 $lb/ft^2 \cdot hr$) using various amounts of lime, ferric chloride, and polyelectrolyte for chemical conditioning as shown in Appendix B.

SECTION X

OPERATING AND MAINTENANCE REQUIREMENTS

Operating and maintenance requirements for the Westgate oxygen-activated sludge system per se have been minimal since the system was brought on-stream in 1971. Minimal levels of operational attention are required because the supply of oxygen, one of the most critical ingredients of any successful aerobic biological treatment system, is automated. A pressure monitoring-inlet oxygen flow control network maintains a constant vapor pressure of several inches of water within the gas space of the oxygenation basin. This system responds rapidly to increase or decrease oxygen flow to the oxygenation basin based on oxygen demand.

Fluctuations in oxygen demand of the biology caused by diurnal fluctuations in flow rate and wastewater strength, fluctuations in the ambient temperature, and seasonal variations in wastewater characteristics are all automatically compensated for by the pressure feed system.

Required maintenance of the oxygen control system has also been minimal. Once a month, the oxygen control system is checked and the pressure set points are readjusted,if necessary. The pneumatic oxygen feed valve is also checked for proper control and operation. Over a two-year operating period, these systems have functioned well,and the repair of only one controller has been required.

Control of the oxygenation basin vent rate at Westgate is straight forward. Currently, manual vent control is used on the OASES^{R} system. It requires adjustment only for seasonal changes and drastic variations in plant loading.

An automatic vent control system originally installed on the OASES^{R} system at Westgate was sized for oxygen-enriched air operation rather than pure oxygen. Control of the vent was switched to a manual mode when the decision was made to use pure oxygen rather than oxygen-enriched air. Vent rate control is achieved by setting four small globe valves, one located on top of the fourth stage of each train, at some fixed flow rate. The vent gas is periodically checked for percent oxygen, and adjustment of the valves is generally necessary only on a monthly basis.

The dissolved oxygen levels maintained in an oxygen-activated sludge system are generally on the order of 10 mg/l in the first stage and may be tapered over the remaining stages to approximately 2 mg/l. These levels are basically designed into the Westgate oxygen system, and a relatively small amount of time on the part of the plant operator is needed to maintain them. Operation of oxygen systems at relatively high DO levels is the key to the stable per-

formance of these systems at normal loads. It also provides an oxygen transfer capacity buffer against unusually heavy organic loads.

Oxygen supply system maintenance requirements vary significantly from one plant to another and are dependent on the nature of the supply. The required tonnage of oxygen plays an important role in determining the type of oxygen supply used. However, the type of financing and the longer term investment picture will also be important. On-site generation of oxygen requires greater capital investment initially and involves operating and maintenance expenditures, but is in the long term less expensive than liquid oxygen supply for a large permanent (>10 years) plant.

At Fairfax, the use of liquid oxygen provides a reliable source of oxygen for the oxygen-activated sludge system, although at a relatively high cost per ton of oxygen. Liquid oxygen was chosen for the Fairfax Westgate facility because of the County's plans to terminate operation at Westgate after three years. This made the short-term cost picture for on-site generation the less attractive alternative.

The liquid oxygen storage system requires very little maintenance. Liquid oxygen levels in the storage tank are checked daily. The liquid oxygen is supplied by contract under tank truck from an industrial gas supplier either on a routine basis or on call. The liquid oxygen vaporizers used to convert liquid oxygen (LOX) to gaseous oxygen (GOX) also require very little maintenance.

The control of solids inventories in the oxygen-activated sludge system at Westgate is easier in some respects than it is in air-activated sludge systems. The maintenance of high DO levels in the oxygenation basin leads to sludge properties (SVI and ZSV) which are good and relatively consistent. The stability of these sludge properties obtained in high DO environments has resulted in consistent thickening in the sludge blanket of the clarifier, and thus provides a very uniform recycle sludge concentration. Control of oxygenation basin MLSS levels requires minimum effort on the part of Westgate personnel on a day-to-day basis since the rate of recycle does not require frequent adjustment.

The capability of operating oxygen-activated sludge systems with a larger inventory of sludge in the clarifiers has benefited the Westgate performance. Thorough penetration of the sludge with oxygen in the oxygenation basin tends to stabilize the degradable particulate matter entrapped within the floc mass and prevents serious septic conditions from developing within the sludge blanket of the clarifier. Flexibility in allowing some accumulation of solids in the clarifier during periods when normal sludge wasting cannot be accomplished for one reason or another permits the operator to concentrate on the problem and not worry about degradation in plant effluent quality.

Maintenance requirements to keep the Westgate oxygenation basin operational consist mainly of checking for oxygen leaks once a month. Leaks have been found in the bolted panels on top of the steel prefabricated covers, and in

the cover to concrete deck seals on occasion. These are generally not serious leaks. They are quickly repaired, and overall oxygen consumption does not appear to reflect their existence within the accuracy of oxygen consumption data.

The Mixing Equipment Company surface aerators installed as part of the oxygen-activated sludge system operated reliably over the two-year reporting period. During this period, there were no problems with the MIXCO gear boxes and drive units. No detrimental buildup of rags or debris on the aerator blades has been experienced, and only one motor has been replaced.

Corrosion of covers, aerator shafts, and aerator blades has been effectively prevented by carefully applying the Placite coating to the white metal, as discussed earlier. When the trains were shut down and drained for work on the primary sedimentation tanks, no corrosion was observed under the covers.

In general, overall plant maintenance requirements (including maintenance of sludge handling equipment) have been reduced over previous operations at the Westgate facility. This is shown in the cost data presented in the following section.

SECTION XI

COST FOR CONVERSION AND OPERATION

The cost to Fairfax County of converting the Westgate treatment plant to the OASES^R oxygen-activated sludge system totalled $1,671,500. A breakdown of the capital costs is presented in Table 10.

The plant conversion was funded through Fairfax County's sewer fund; the County did not amortize the cost of converting the Westgate Plant to the OASES^R system. The sewer fund receives money paid by household and industrial consumers who tap into the sewer system. Charges are based on the amount of water consumed, and new customers must pay the cost of tying into the system.

Operating and maintenance costs for the converted treatment plant totalled $475,895 (including $66,313 for liquid oxygen) during the County's 1973 fiscal year (July 1, 1972 through June 30, 1973). An itemized statement of these costs is given in Table 11. Based on an average influent flow of 0.46 m^3/sec (10.4 mgd), the volumetric operating and maintenance costs over this period were 3.3 cents/m^3 (12.5 cents/1000 gallons) treated.

For comparison, the annual costs for the aeration-sedimentation system and the chemical treatment system are itemized in Table 12 for fiscal years 1968 and 1971, respectively. Average flows of approximately 0.46 m^3/sec (10.4 mgd) were also observed during these periods, resulting in costs of 1.8 cents/m^3 (6.8 cents/1000 gallons) treated with aeration-sedimentation and 4.2 cents/m^3 (15.9 cents/1000 gallons) treated chemically. Operating and maintenance costs for all three systems represented in Tables 11 and 12 include the cost of sludge conditioning and dewatering, but not the cost of hauling the dewatered sludge to landfill. Annual oxygen-activated sludge system costs compare very favorably, especially in light of the BOD_5 removal efficiencies of the three systems.

The sharp jump in annual compensation between fiscal years 1971 and 1973 was due to an increase in manpower of about 60 percent at the Westgate plant in October 1971. Manpower was increased because of the unknowns associated with the upgrading including operation of flotation thickeners, dewatering of secondary sludges, and operation of the oxygen-activated sludge process.

TABLE 10. CONSTRUCTION COSTS FOR WESTGATE OXYGEN-ACTIVATED SLUDGE SYSTEM

Item	Consultant or Contractor	Cost
Administrative and Consultant Fees	Fairfax County Staff, Engineering Science	$ 50,000.00 (est.)
Two New Final Clarifiers, Anchorage and Scraper Mechanisms	Mason and Associates	187,518.00
Foundations for Sludge Recycle-Flotation Thickening Blg., Excavation and Grading for Clarifiers,and Installation of Sludge Recycle Lines	A. Beiro Construction Company	195,362.00
Mechanical and Electrical Equipment Including Sludge Flotation Systems and Sludge Recycle Systems	Hercules Construction Company	378,084.65
Oxygen Supply and Dissolution Equipment Including Liquid Oxygen Storage Vessel and Vaporizers, Aerators, Covers, Switch Gear, Oxygen Inlet and Vent Control Systems, and all Baffles and Concrete Modifications	Air Products and Chemicals	860,530.00
	Total	$1,671,494.65

TABLE 11. OPERATING AND MAINTENANCE COSTS[a] FOR WESTGATE OXYGEN-ACTIVATED SLUDGE PLANT INCLUDING SLUDGE DEWATERING FOR FY 73[b]

Item	Expenditure
Compensation[c]	$206,341
Operating Expenditures	
Electrical Service	28,003
Chlorine	6,818
Lime	4,413
Ferric Chloride	14,259
Polyelectrolyte	51,069
Other Chemicals	2,222
System Replacement Parts	8,470
Water Service	8,812
Other Utilities	-
EMTA Charges[d]	2,189
Misc. Supplies	-
Wearing Apparel	4,277
Safety Supplies and Equip.	1,217
Cleaning Supplies	1,242
Heating Fuel	3,089
Liquid Oxygen	66,313
Support by Maint. & Constr.	3,730
Support by Other Dept.	25,209
Misc. Expenditures	38,222
Total Expenditures	$475,895

(a)Figures do not include administrative, laboratory, or loadlugger (sludge hauling) costs.
(b)July 1, 1972-June 30, 1973.
(c)Salaries, wages, and fringe benefits.
(d)Charges for vehicle repair and maintenance.

TABLE 12. OPERATING AND MAINTENANCE COSTS[a] FOR WESTGATE AERATION-SEDIMENTATION AND CHEMICAL TREATMENT SYSTEMS (FY 68 AND FY 71)

Item	Expenditures	
	Aeration-Sedimentation System - FY 68[b]	Chemical Treatment System - FY 71[c]
Compensation[d]	$149,022	$126,731
Operating Expenditures		
Electrical Service	18,401	11,490
Chlorine	15,867	25,679
Lime	2,797	24,660
Ferric Chloride	0	189,800
Polyelectrolyte	0	45,625
Other Chemicals	4,155	7,715
System Replacement Parts	15,260	11,321
Water Service	-	8,691
Other Utilities	5,369	-
EMTA Charges[e]	23,647	199
Misc. Supplies	15,245	-
Wearing Apparel	-	3,055
Safety Supplies & Equip.	-	194
Cleaning Supplies	-	3,619
Heating Fuel	-	1,778
Liquid Oxygen	-	-
Support by Maint. & Constr.	-	51,387
Support by Other Dept.	-	55,228
Misc. Expenditures	14,681	39,257
Total Expenditures	$264,444	$606,429

(a)Figures do not include administrative, laboratory, or loadlugger (sludge hauling) costs.
(b)July 1, 1967-June 30, 1968.
(c)July 1, 1970-June 30, 1971.
(d)Salaries, wages, and fringe benefits.
(e)Charges for vehicle repair and maintenance.

SECTION XII

GENERAL DESIGN CONSIDERATIONS FOR APPLICATION OF OXYGEN-ACTIVATED SLUDGE IN WASTEWATER TREATMENT PLANTS

To realize the full benefits of oxygenation in activated sludge systems, whether for new or converted plants, it is essential that these systems be properly designed. The intent of this section is to suggest some of the factors which must be considered in planning either conversion of existing plants to oxygen-activated sludge or in planning completely new ("grass roots") facilities.

The economic benefits of using oxygen-activated sludge are clearly apparent in upgrading an existing plant. The prospect of doubling or tripling the capacity of an existing air-activated sludge system without expansion of the aeration basin itself along with reduced time for project completion and lower construction costs is very attractive. With "grass roots" systems, economic and performance benefits also accrue because of reduced power costs, smaller land requirements, reduced sludge handling costs, and greater process stability.

Certain design objectives and criteria must be considered in contemplating the conversion of an existing air-activated sludge system to oxygen. Although many of these are common to air-activated sludge systems, the range of values associated with them is markedly different. The projected capacity of the converted activated sludge system is one of the key factors when contemplating expansion by conversion to oxygen, as opposed to using other biological processes.

The anticipated capacity of a converted oxygen-activated sludge system can be estimated based on the mass of BOD_5 removed per day in the existing facility. As a rule of thumb, the engineer can assume that the converted oxygen-activated sludge plant will have from two to three times the BOD_5 removal capacity of the existing air system. Using anticipated BOD_5 strengths and removal efficiencies as desired, the flow capacity of the converted aeration system can be quickly estimated using the following equation:

$$Q_2 = \frac{3\ Q_1\ (X_1 - X_2)}{y_1 - y_2}$$

where:

Q_1 = Existing average basin flow, excluding recycle

Q_2 = Projected average basin flow capacity for converted system, excluding recycle

X_1 = Existing average aerator influent BOD_5

X_2 = Existing average system effluent BOD_5

y_1 = Anticipated average aerator influent BOD_5 for converted system

y_2 = Required average system effluent BOD_5 for converted system

The above equation assumes an increased BOD_5 removal capacity factor with oxygen of 3.0. The actual increased capacity factor will depend on the oxygen transfer capabilities of different existing air aeration systems. The utility of the equation diminishes if wastewater characteristics are anticipated to change significantly after the conversion.

If the anticipated increased aeration basin flow capacity appears to satisfy the requirements for the upgraded plant, several other factors must then be evaluated. These factors include: 1) the amenability of the existing basin to modification to the proper reactor configuration and installation of covers and aerators, 2) determination of the required additional clarifier capacity to handle the higher flow rates using conventional criteria for clarifier sizing, 3) the compatibility of existing sludge handling equipment with anticipated increased plant capacity and other periphery equipment and determination of any required additional sludge handling capacity, and 4) the best oxygen source for the converted plant.

The existing basin configuration will usually have to be modified in some fashion to achieve the proper reactor configuration for an oxygen-activated sludge system. Depending on the structural arrangement of the existing aeration basin, this modification may be relatively easy or difficult to accomplish. The configuration of the aeration basin after conversion may be either that of discretly-staged oxygen-activated sludge system or that of a controlled back-mix, non-liquid baffled, oxygen-activated sludge system.

It is, of course, preferrable to avoid major modifications to the existing basin, where possible. In the best cases, surface aerators will be compatible with existing concrete structures, and minimum modification will be necessary. In many cases, the freeboard, or distance from the mixed liquid surface to the under surface of the cover, will be sufficient for the aeration basin covers to be installed directly on the existing tank surface. In other cases, additional freeboard will be required.

The type of aerator used in any given conversion will be a function of the particular constraints imposed by the existing basin. Selection will be a function of five parameters:

1) The available liquid surface area within the existing concrete tanks (i.e., the length to width ratio of the liquid surface in the full tank),

2) The placement of existing structural members and Y walls,

3) Tank depth,

4) Oxygen transfer requirements, and

5) Mixing requirements.

Where possible, the surface aerator is highly recommended as an efficient, simple, reliable oxygenation device. OASES^{R} systems typically employ slow-speed, four-paddle, axial-flow impeller type surface aerators. They are cost effective and reliable and under standard conditions are capable of transferring up to 2.4 kg oxygen/kw·hr (4 lb/hp·hr) from air or 9.7 kg/kw·hr (16 lb/hp·hr) from an 80 percent oxygen atmosphere.

Submerged turbines or combination submerged turbine-surface aerators are utilized in oxygen-activated sludge systems in some instances in which the existing basins are very deep tanks, on the order of 9.1 m (30 ft), or where surface area is limiting. In some cases, the combined aerator is more reliable and efficient than the submerged turbine and provides excellent turndown capability.

Horsepower requirements for the oxygen dissolution system can be readily estimated by using approximate transfer efficiencies of 3.0 to 3.6 kg oxygen/kw·hr (5.0 to 6.0 lb/hp·hr). This range of efficiencies includes general consideration for holding minimum DO levels of 8 to 10 mg/l in the first oxygenation zones and tapering these to provide an average of 4 mg/l throughout the total basin. It also includes gas phase composition and oxygen utilization efficiency considerations and allowances for the lower Alpha and Beta coefficients inherent to wastewater.

As the BOD_5 of the influent wastewater exceeds 300 mg/l and approaches 1,000 mg/l, the transfer efficiency will drop from 3.6 kg/kw·hr (6.0 lb/hp·hr) toward 3.0 kg/kw·hr (5.0 lb/hp·hr). The transfer efficiency drops as the waste strength increases due to the increasing quantities of carbon dioxide liberated in the oxidation reactions. Carbon dioxide dilutes the oxygen atmosphere and, thus, reduces the driving force for dissolving oxygen.

Additional clarifier capacity will normally be necessary to handle the increased hydraulic flow in the converted plant. Proper clarifier design is essential for success with any activated sludge process, and it is important, therefore, to review here the criteria used in sizing clarifiers with oxygen-activated sludge systems.

It is generally recognized that there is currently a less than complete understanding of clarifier performance. Particularly, this includes a lack of ability to accurately predict effluent suspended solids and, further, to design clarifiers to take full advantage of sludge properties. Sludge properties can actually be excellent by typical standards, e.g., an SVI of 60 ml/g TSS and a ZSV of 2.4 m/hr (8 ft/hr), and yet clarifier performance, in particular effluent suspended solids, may actually deteriorate with further improvement in sludge properties. The latter is really the result of applying standard clarifier design practices to nonstandard sludges.

Currently, standard air-activated sludge criteria are applied to the design of oxygen-activated sludge secondary clarifiers. Permissible overflow rates and bottom loadings correspond generally to the standards being established to meet the new effluent suspended solids criteria with air-activated sludge systems. Overflow rates of 24.4 to 32.6 $m^3/day \cdot m^2$ (600 to 800 gpd/ft^2) are typically specified at average design flow, and bottom loadings are limited to a maximum of 220 kg $TSS/m^2 \cdot day$ (45 $lb/ft^2 \cdot day$) at peak hydraulic loading. In keeping with this practice, Air Products and Chemicals normally recommends similar design criteria for OASES^R systems.

The critical design criterium for establishing clarifier diameter or surface area may be either bottom loading or surface overflow rate. At MLSS levels above 5,500-6,500 mg/l, the controlling parameter for clarifier diameter shifts from surface area to bottom loading, thereby yielding larger clarifiers than would a surface area criterium alone. High MLSS levels are not an inherent requirement of oxygen systems, however. Westgate has demonstrated that high MLSS are not essential to successful operation of oxygen-activated sludge systems. Current OASES^R systems are typically designed at MLVSS levels of approximately 3,500 mg/l, where clarifier surface overflow rate is the major criterium in sizing the clarifier.

With the increased plant capacity available through conversion to oxygen, total dry weight sludge production will increase to some extent. The increase will be a function of wastewater characteristics and plant loading. Sludge production rates in activated sludge systems are typically so erratic that it is difficult to generate an accurate measure of production for a given plant, as evidenced by the data scatter in Figures 66 and 71. Therefore, no attempt is made in this report to provide a tool for estimating sludge production in general. In evaluating and sizing additional sludge handling equipment for the converted plant, it should be remembered that sludge recycle concentrations produced by a properly operated oxygen system should have a solids concentration of at least 1.5 percent, and may reach 2.0 percent. A given dry weight of sludge wasted from an oxygen-activated sludge system under these circumstances would have considerably less volume, therefore, than normally anticipated with an air system of the same rated capacity. Thus, requirements for sludge holding tanks, pumping equipment, thickeners, and chemicals for sludge conditioning can be expected to less than those for an air system of like capacity.

The source of oxygen supply to be used for the converted plant will depend to a large extent on the amount of oxygen required per day and the anticipated term of operation of the oxygen-activated sludge plant. It will also depend on the cost of capital relative to municipal versus industrial financing mechanisms. For larger plants to be operated 10 years or more, and those which will use 13,600 kg (15 tons) oxygen/day or more, cryogenic oxygen generators normally provide the lowest overall cost. These generators are reliable and efficient. Noncryogenic adsorption oxygen generators have been specified for treatment plants with lower oxygen requirements. Selection of cryogenic versus noncryogenic generators in the range of 9,000-18,000 kg/day (10-20 tons/day) will depend on the particular situation.

In selecting cryogenic versus noncryogenic oxygen generation, it is important to remember that the cryogenic oxygen generator can provide an on-site supply of liquid oxygen to serve as a backup to the system in the event that the oxygen generator is down for maintenance. A noncryogenic system cannot do this.

At less than 4,500 kg/day (5 tons/day), liquid oxygen may be the most economical alternative because manpower is generally limited at smaller facilities and operation with LOX is expedient.

In sizing the oxygen generator, several factors must be considered. The major factor is, of course, the anticipated biological oxygen consumption. This is generally on the order of 0.8 to 1.5 kg oxygen/kg BOD_5 removed (lb/lb) and is a function of the F/M loading on the system. For preliminary estimates, including oxygenation basin vent losses and effluent DO makeup, 1.2 kg oxygen feed gas/kg BOD_5 removed (lb/lb) should provide an adequate guide for sizing the generator.

Requirements for liquid oxygen as a backup oxygen supply and for peak demands (peak shaving) must be considered in the sizing of the oxygen generator. The size of the backup LOX storage tank is usually based on a two to four day maximum anticipated outage of the oxygen generator. Cryogenic generators have excellent "on-stream" records based on their design and use in industrial applications. They are typically "on-stream" 98 percent of the time.

Power requirements per unit mass of oxygen generated per day will vary with the size of the oxygen generator. In the range of 13,000-45,000 kg/day (15-50 tons/day), the cryogenic oxygen generator will require approximately 0.008 kw/kg (16 kw/ton) oxygen generated/day. Above 45,000 kg/day (50 tons/day), the power requirement will be on the order of 0.006 kw/kg (12 kw/ton) oxygen generated/day. Noncryogenic generators require 0.010-0.012 kw/kg (20-23 kw/ton) oxygen generated/day.

Many of the design criteria for conversion of existing air plants to oxygen-activated sludge systems will apply to "grass roots" facilities as well. Design of the oxygenation system and clarifiers must, of course, be compatible with the effluent quality requirements at the specified capacity.

Ancillary facilities must also be designed for compatibility with the oxygen system including sludge handling, thickening, disinfection, and tertiary polishing equipment.

There are a number of approaches to sizing the oxygenation basin. These include the use of food/biomass (F/M) loading, sludge retention time (SRT - particularly useful if nitrification is to be achieved), and minimum detention time as specified by a state or federal regulation and verified by pilot plant studies for given wastes.

For wastewaters which are primarily domestic in character and which have a BOD_5 concentration of 200 mg/l or less, nominal reactor detention times based on raw wastewater flow of 1.4 to 2.0 hr are normally sufficient for oxygen-activated sludge systems. Actual detention times (including sludge recycle flows) as low as 1.1 hr have been used for the treatment of municipal wastewater, as for example at Detroit, Michigan, where a 13 m^3/sec (300 mgd) oxygen-activated sludge module is already in operation and a second 26 m^3/sec (600 mgd) oxygen module, now under construction, is being furnished by Air Products and Chemicals, Inc.

In plants where the minimum detention time has been established at some specific value, but the waste strength is low, the engineer has the flexibility of designing for variable MLVSS levels. Design with low MLVSS levels (2,000-3,500 mg/l) may be required in order to maintain a minimum desired food/biomass loading within the oxygenation basin.

Oxygen-activated sludge systems tend to operate optimally at higher loadings. Operation at an extremely low F/M may, as in any activated sludge system, lead to over oxidation of sludge and floc dispersion.

For wastewaters of higher strengths (BOD_5's above 300 mg/l), it is good practice to design the system on the basis of F/M. Typical F/M's employed in oxygen-activated sludge systems run substantially above those generally employed in air-activated sludge systems. The values of F/M selected for design will depend on several factors including the order of importance to the designer of sludge production, sludge properties, and land availability.

For municipal wastewaters, F/M values of 0.4 to 1.0 kg BOD_5/day·kg MLVSS (lb/day·lb) are commonly employed in oxygen-activated sludge design, depending on the factors described above. For industrial wastewaters, F/M values may be relatively high, e.g., 1.5 for a cannery wastewater, or relatively low, e.g., 0.3 or lower for a chemicals plant wastewater. In the latter instance, high MLVSS levels and long sludge ages are necessary to effectively treat these difficult to degrade wastes.

The effluent total BOD_5 obtained from activated sludge systems varies with food to biomass ratio. With oxygen systems, the variation in soluble BOD_5 is minimal. Variation in total BOD_5 most often stems from the biological

activity and concentration of the effluent suspended solids and not from breakthrough of soluble BOD_5. Thus, design of the secondary clarifier plays an important role in determining effluent quality from an oxygen-activated sludge system.

With some hard to degrade industrial wastes or highly industrialized municipal wastes, the F/M may have a pronounced effect on effluent quality including soluble BOD_5 and COD. In these situations, a pilot plant study or lab study is beneficial in establishing proper design loadings and overall optimum system design.

A great deal of freedom is available to the engineer establishing the reactor configuration in a "grass roots" oxygen-activated system. Because high oxygen transfer rates can be attained with pure oxygen, it is possible to take advantage of the pseudo first-order rate kinetics of the activated sludge process. The most efficient reactor in this regard according to chemical reactor design theory is an "idealized plug flow" system wherein the food and biomass move cocurrently and without back-mixing through the aeration system.

There are two approaches to reactor design which simulate or create in part the environment found in an "idealized plug flow" reactor. One approach is to design the reactor as a series of discreet completely mixed compartments or stages. Another approach, a second generation design, has been developed by Air Products and Chemicals and termed the controlled back-mix OASES^R system. In this system, the basin geometry and the aerators (aeration and mixing components) are designed and specified to create a controlled flow regime. This eliminates the need for flow restrictive baffles and creates a more gradual changing micro-environment.

The benefits of the controlled back-mix concept, which typically employs a greater number of smaller aerators, compared to the discretely staged concept include:

1) Greater oxygen utilization efficiency through increased gas staging,

2) Increased potential for power savings within the oxygenation basin by shutting down alternate aerators under low loading conditions,

3) Continued operation of a given train with one or more aerators down for maintenance,

4) Increased stability under hydraulic and organic shock loading situations,

5) Enhanced stability of sludge properties due to maintenance of proper food to biomass ratios in the early phases of contact over a broader range of hydraulic flows and influent strengths, and

6) Avoidance of dead pockets adjacent to staging baffles.

In general, the total space and geometry requirements for the discretely staged and controlled back-mix OASES® systems are the same. For either system, the length and width of each train or stage will depend on the system capacity and dissolution power requirements. Length and width dimensions for the surface area in each aerator zone must exceed the throw diameter of the aerator, which will increase with increasing power rating.

Concrete is the best construction material for oxygenation basins, including the roof structures over the basins. The aerators are generally mounted on relatively small steel cover plates on the concrete roof. The potential for leaks is minimized with an all poured concrete construction, but prestressed segmented covers are also utilized. Structurally, the span of the roof may require that pillar supports be provided for the aerators within the tank. These pillars can also function as anti-swirl baffles.

The choice of aeration device, i.e., surface aerators (with or without lower mixing blades) submerged turbine aerators, or combined submerged turbine-surface aerators (Figure 75), will depend on plant site constraints. For those plants located where land is a premium, it is logical to utilize deep tanks to save oxygenation basin area. Submerged turbines have been favored in the past for these deep tank operations. Recently, however, surface aerator technology has advanced to the state where they are used routinely for liquid depths up to 6.7-7.6 m (22-25 ft) with bottom mixing impellers. With careful design, they have been used at depths of 9.1 m (30 ft).

Where surface area begins to limit the mass transfer capacity of surface aerators in deep tanks, the combination of a submerged turbine and a surface aerator has been found effective.

Where land is not the most important criteria and shallower tanks can be used, the slow-speed surface aerator because of its simplicity, efficiency, and reliability is the preferred method of oxygen dissolution for oxygen-activated sludge systems.

The clarifier requirements for "grass roots" systems are basically the same as those previously specified for conversions. Similarly, sizing of sludge handling equipment and oxygen generation equipment has also been addressed in the previous discussion on conversion of existing air systems to oxygen.

As a final comment, the advent of oxygen-activated sludge systems has brought with it an opportunity and a requirement for the serious application of chemical engineering concepts to wastewater treatment. Oxygen has provided an opportunity because it is possible through chemical engineering practices to develop the full capability of the activated sludge microorganisms. Limitations are no longer imposed by oxygen deficit due to inadequate oxygen mass transfer from air to liquid and liquid to solids. Oxygen has provided a requirement to use chemical engineering concepts because of the need to properly account for the interactions of gas, liquid, and solid (biomass) phases within oxygen-activated sludge systems.

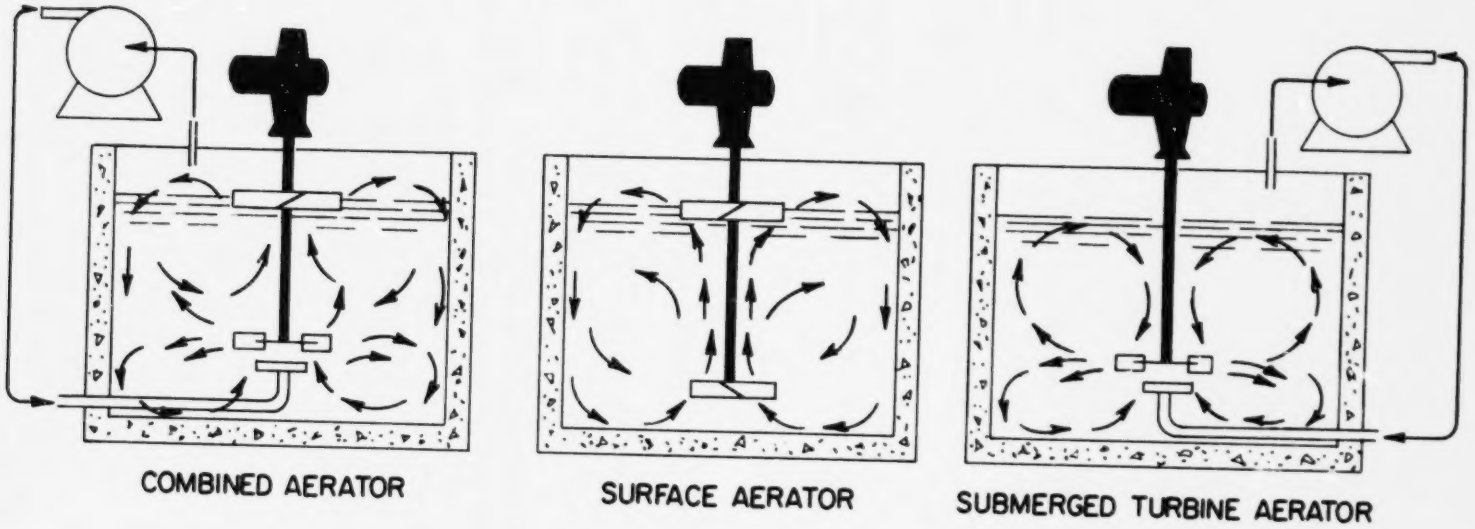


FIGURE 75. TYPES OF AERATORS

SECTION XIII

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SECTION XIV

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APPENDIX A

DATE	10/ 1/71	10/ 2/71	10/ 3/71	10/ 4/71	10/ 5/71	10/ 6/71	10/ 7/71	10/ 8/71	10/ 9/71	10/10/71	10/11/71	10/12/71	10/13/71	10/14/71
INFLUENT WASTEWATER														
FLOW RATE(MGD),MGD	5.000	5.000	5.000	9.000	9.000	8.000	9.000	9.000	9.000	12.000	13.000	8.000	6.000	8.650
BOD5,MG/L	242.000	219.000	254.000	143.000	124.000	169.000	165.000	174.000	165.000	111.000	146.000	139.000	238.000	170.000
BOD5,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COD,MG/L	544.000	492.000	416.000	435.000	314.000	351.000	353.000	414.000	414.000	240.000	248.000	329.000	514.000	367.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	282.000	342.000	174.000	166.000	98.000	140.000	188.000	164.000	123.000	114.000	96.000	146.000	240.000	194.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.160	7.060	7.290	--	7.260	7.360	7.360	6.800	7.200	7.420	7.210	7.170	7.200	7.220
EFFLUENT														
BOD5,MG/L	48.000	43.000	48.000	53.000	35.000	33.000	35.000	40.000	46.000	41.000	32.000	29.000	57.000	41.000
BOD5,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COD,MG/L	108.000	103.000	112.000	113.000	95.000	96.000	60.000	76.000	83.000	76.000	91.000	93.000	122.000	104.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	22.000	40.000	14.000	18.000	11.000	20.000	18.000	5.000	55.000	34.000	36.000	46.000	40.000	34.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.300	7.100	7.210	--	7.190	7.240	7.290	6.880	7.330	7.310	7.280	7.080	6.590	6.720
TOTAL REMOVALS														
BOD5 REMOVED,%	80.165	80.365	81.102	71.038	72.868	80.473	78.788	77.011	72.121	63.063	78.471	79.137	76.050	75.882
COD REMOVED,%	80.147	83.108	73.077	74.023	82.484	72.650	83.003	81.643	80.076	68.333	67.339	72.644	76.357	71.662
TSS REMOVED,%	92.199	88.304	91.954	89.157	88.775	87.500	90.426	97.024	54.167	70.175	61.702	68.493	83.333	82.474
BIOMASS LOADING														
BOD5/DAY/#LVSS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	77.957	70.548	81.823	94.322	66.489	87.106	85.044	89.683	99.044	85.817	87.621	71.643	122.670	94.741
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVI,ML/GTSS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZSV,FT/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEMPERATURE,C **	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DETENTION TIME,HR	4.648	4.648	4.644	2.905	2.905	2.935	2.935	2.905	2.905	1.937	2.324	2.905	2.905	2.687
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	230.443	230.443	230.443	368.709	368.709	368.709	368.709	368.734	368.709	553.064	460.887	368.709	368.709	398.667
SOLIDS LOAD,LB/FT2/DAY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RECYCLE RATIO,(R)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS OBTAINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

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APPENDIX A

DATE	10/15/71	10/16/71	10/17/71	10/18/71	10/19/71	10/20/71	10/21/71	10/22/71	10/23/71	10/24/71	10/25/71	10/26/71	10/27/71	10/28/71
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	8.560	8.500	8.500	8.500	8.500	8.500	8.500	8.500	9.500	10.400	11.600	11.300	11.980	9.200
BOD5,MG/L	209.000	233.000	206.000	222.000	181.000	184.000	214.000	160.000	189.000	170.000	135.000	114.000	111.000	150.000
BOD5,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COD,MG/L	361.000	432.000	486.000	531.000	432.000	434.000	441.000	427.000	386.000	269.000	364.000	266.000	235.000	300.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	196.000	146.000	252.000	396.000	243.000	156.000	208.000	208.000	210.000	216.000	108.000	144.000	128.000	156.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.190	6.270	7.110	7.200	7.410	7.300	7.170	7.100	7.300	7.280	--	6.800	7.200	7.000
EFFLUENT														
BOD5,MG/L	41.000	114.000	130.000	124.000	146.000	--	--	67.000	40.000	44.000	39.000	36.000	24.000	12.000
BOD5,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COD,MG/L	94.000	280.000	384.000	293.000	312.000	--	--	269.000	133.000	123.000	138.000	94.000	94.000	83.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	37.000	90.000	--	148.000	180.000	186.000	226.000	129.000	51.000	48.000	32.000	41.000	42.000	32.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.640	6.380	6.680	7.100	7.380	7.140	7.180	7.000	7.290	7.150	--	6.800	7.100	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	80.383	51.073	36.893	44.144	19.337	100.000	100.000	58.125	78.836	74.118	71.111	68.421	78.378	92.000
COD REMOVED,%	73.961	35.185	20.988	44.821	27.778	100.000	100.000	37.002	65.544	54.275	62.088	64.662	60.000	72.333
TSS REMOVED,%	81.122	38.356	100.000	62.626	25.926	--	--	37.981	75.714	77.778	70.370	71.528	67.188	79.487
BIOMASS LOADING														
BOD5/DAY/MLVSS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	115.269	127.599	112.813	121.575	99.122	100.765	117.194	87.621	115.680	113.908	100.893	82.995	85.674	88.910
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVI,ML/GTSS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZSV,FT/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEMPERATURE,C **	---	--	--	--	--	--	--	--	--	--	--	--	--	--
DETENTION TIME,HR	2.715	2.734	2.734	2.734	2.734	2.734	2.734	2.734	2.446	2.234	2.004	2.057	25.030	25.000
FINAL SETTLER													1.940	2.526
OVERFLOW,GAL/FT2/DAY	394.519	391.754	391.754	391.754	391.754	391.754	391.754	391.754	391.754	437.942	479.322	534.629	525.802	552.142	424.016
SOLIDS LOAD,LB/FT2/DAY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RECYCLE RATIO,(R/Q)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	10/29/71	10/30/71	10/31/71	11/ 1/71	11/ 2/71	11/ 3/71	11/ 4/71	11/ 5/71	11/ 6/71	11/ 7/71	11/ 8/71	11/ 9/71	11/10/71	11/11/71
INFLUENT WASTEWATER														
FLOW RATE(QI),MGD	10.000	9.600	9.420	9.330	9.470	9.180	8.960	8.620	9.140	9.090	8.900	9.200	8.290	9.410
BOD5,MG/L	160.000	182.000	172.000	156.000	145.000	195.000	145.000	203.000	161.000	137.000	151.000	173.000	215.000	191.000
BOD5,SOL,MG/L	--	--	--	--	33.000	33.000	12.000	65.000	--	--	52.000	60.000	76.000	72.000
COD,MG/L	382.000	384.000	378.000	391.000	344.000	424.000	316.000	487.000	357.000	--	389.000	441.000	448.000	486.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	130.000	164.000	114.000	112.000	150.000	196.000	142.000	182.000	116.000	158.000	232.000	195.000	238.000	208.000
VSS,MG/L	--	--	--	112.000	150.000	194.000	142.000	179.000	114.000	156.000	163.000	194.000	176.000	170.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.110	6.750	7.000	7.193	7.000	7.000	6.650	6.900	7.000	7.130	7.200	6.700	7.100	6.700
EFFLUENT														
BOD5,MG/L	23.000	30.000	23.000	21.000	36.000	35.000	70.000	35.000	24.000	111.000	78.000	33.000	60.000	20.000
BOD5,SOL,MG/L	--	--	--	--	9.000	7.000	7.000	15.000	--	--	5.000	17.000	17.000	17.000
COD,MG/L	92.000	68.000	79.000	82.000	113.000	94.000	214.000	65.000	97.000	--	249.000	98.000	143.000	74.000
COD,SOL,MG/L	--	--	--	47.000	74.000	55.000	40.000	--	--	54.000	73.000	--	66.000	51.000
TSS,MG/L	26.000	22.000	24.000	21.000	60.000	36.000	124.000	56.000	42.000	206.000	242.000	67.000	121.000	27.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.050	6.650	7.000	6.900	6.900	6.800	6.600	6.750	7.100	6.900	7.100	6.700	7.100	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	85.625	83.516	86.628	86.538	75.172	82.051	51.724	82.759	85.093	18.978	48.344	80.925	72.093	89.529
COD REMOVED,%	75.916	82.292	79.101	79.028	67.151	77.830	32.278	86.653	72.829	--	35.990	77.778	68.080	84.774
TSS REMOVED,%	80.000	86.585	78.947	81.250	60.000	81.633	12.676	69.231	63.793	--	--	65.641	49.160	87.019
BIOMASS LOADING														
BOD5/DAY/MLVSS	--	--	--	0.507	0.539	0.637	0.485	0.586	0.536	0.402	0.504	0.640	0.704	0.790
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	103.084	112.568	104.388	93.773	88.469	115.332	83.704	112.739	95.222	90.233	86.584	102.543	113.586	115.796
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VSS,MG/L	--	--	--	2967.274	2632.725	2900.911	2767.274	3084.321	2850.000	2799.999	2750.912	2567.046	2584.777	2350.000
SVI,ML/GTSS	--	--	--	73.000	74.000	75.000	95.000	121.000	--	--	--	104.000	109.000	132.000
ZSV,FT/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEMPERATURE,C **	25.000	25.000	25.000	22.000	22.000	21.000	15.000	16.000	17.000	16.000	17.000	13.000	14.000	17.000
DETENTION TIME,HR	2.324	2.421	2.467	2.491	2.454	2.532	2.594	2.696	2.532	2.557	2.611	2.526	2.834	2.470
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	463.887	442.451	434.155	430.007	436.459	423.094	412.954	397.284	423.394	418.946	410.189	424.016	377.927	433.694
SOLIDS LOAD,LB/FT2/DAY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RECYCLE RATIO,(RQ)	0.000	0.000	0.000	31.393	34.498	39.684	36.205	39.118	42.140	36.249	37.787	38.043	38.780	47.333

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	11/12/71	11/13/71	11/14/71	11/15/71	11/16/71	11/17/71	11/18/71	11/19/71	11/20/71	11/21/71	11/22/71	11/23/71	11/24/71	11/25/71
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.360	10.200	10.100	10.200	9.900	9.900	10.300	10.700	10.800	10.900	10.900	10.800	10.900	13.200
BOD5,MG/L	226.000	208.000	171.000	165.000	185.000	190.000	185.000	165.000	134.000	211.000	169.000	188.000	167.000	149.000
BOD5,SOL,MG/L	90.000	116.000	57.000	43.000	46.000	53.000	40.000	60.000	52.000	50.000	47.000	55.000	44.000	42.000
COD,MG/L	455.000	414.000	439.000	405.000	409.000	549.000	423.000	580.000	455.000	314.000	423.000	392.000	361.000	332.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	242.000	260.000	178.000	168.000	134.000	253.000	158.000	138.000	200.000	150.000	144.000	293.000	78.000	152.000
VSS,MG/L	232.000	252.000	153.000	126.000	134.000	221.000	158.000	128.000	180.000	136.000	136.000	140.000	--	152.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.900	6.900	7.100	7.200	7.150	7.220	7.200	7.200	7.000	7.200	7.100	7.300	7.400	7.100
EFFLUENT														
BOD5,MG/L	26.000	37.000	19.000	30.000	24.000	77.000	38.000	39.000	47.000	81.000	44.000	38.000	36.000	32.000
BOD5,SOL,MG/L	18.000	32.000	20.000	4.000	6.000	35.000	12.000	16.000	14.000	16.000	11.000	16.000	14.000	6.000
COD,MG/L	71.000	102.000	78.000	58.000	87.000	192.000	122.000	94.000	196.000	200.000	153.000	133.000	129.000	123.000
COD,SOL,MG/L	51.000	75.000	8.000	12.000	31.000	35.000	39.000	27.000	51.000	67.000	51.000	43.000	--	--
TSS,MG/L	45.000	38.000	35.000	31.000	43.000	33.000	53.000	44.000	43.000	111.000	76.000	93.000	67.000	61.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.800	6.700	6.900	7.000	7.010	6.980	7.250	7.000	7.000	6.800	7.000	7.100	7.200	7.110
TOTAL REMOVALS														
BOD5 REMOVED,%	88.496	82.212	88.889	81.818	87.027	59.474	79.459	76.364	64.925	61.611	73.966	79.787	78.443	78.523
COD REMOVED,%	84.396	75.362	82.232	85.679	78.729	65.027	71.158	83.793	56.923	36.306	63.830	66.071	64.266	62.952
TSS REMOVED,%	81.405	85.385	80.337	81.548	67.910	86.957	66.456	68.116	78.500	26.000	47.222	67.931	14.103	59.868
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.785	0.894	0.594	0.589	0.667	0.568	0.715	1.189	0.654	0.642	0.579	0.645	0.829	1.934
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	136.287	136.689	111.273	108.431	117.999	121.188	122.767	113.747	93.239	148.177	118.682	130.814	117.277	126.716
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VSS,MG/L	2783.637	2449.999	2999.999	2959.228	2833.751	3417.046	2750.683	1533.637	2286.601	3701.595	3284.093	3251.367	2268.642	1650.000
SVI,ML/GTSS	--	--	114.500	135.000	144.000	95.000	92.000	103.000	109.000	84.000	68.000	66.000	66.000	52.000
ZSV,FT/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEMPERATURE,C **	20.000	22.000	23.000	22.000	22.000	22.000	22.000	22.000	20.000	21.000	21.000	21.000	20.000	19.000
DETENTION TIME,HR	2.482	2.279	2.301	2.279	2.348	2.348	2.256	2.172	2.152	2.132	2.132	2.152	2.132	1.761
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	431.390	470.104	465.496	470.104	456.278	456.278	474.713	493.149	497.758	502.366	502.366	497.758	502.366	608.370
SOLIDS LOAD,LB/FT2/DAY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RECYCLE RATIO,(%)	52.917	49.402	51.033	51.049	52.192	39.697	31.689	27.897	33.917	33.642	27.844	21.917	22.073	18.523

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	11/26/71	11/27/71	11/28/71	11/29/71	11/30/71	12/ 1/71	12/ 2/71	12/ 3/71	12/ 4/71	12/ 5/71	12/ 6/71	12/ 7/71	12/ 8/71	12/ 9/71
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	12.700	12.200	12.200	12.350	12.350	12.600	12.500	11.900	13.000	11.900	13.000	13.400	13.900	13.100
BOD5,MG/L	133.000	185.000	161.000	235.000	162.000	180.000	183.000	166.000	182.000	156.000	173.000	106.000	116.000	124.000
BOD5,SOL,MG/L	32.000	34.000	--	--	85.000	79.000	60.000	--	--	--	34.000	79.000	35.000	44.000
COD,MG/L	332.000	332.000	411.000	329.000	486.000	311.000	480.000	411.000	--	309.000	386.000	262.000	655.000	544.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	147.000	136.000	94.000	152.000	148.000	70.000	80.000	108.000	168.000	124.000	154.000	142.000	122.000	141.000
VSS,MG/L	122.000	136.000	--	143.000	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.120	7.220	7.200	7.000	7.000	7.000	7.300	6.600	6.800	6.900	6.900	7.300	7.100	6.900
EFFLUENT														
BOD5,MG/L	43.000	44.000	36.000	47.000	38.000	29.000	28.000	28.000	37.000	25.000	30.000	25.000	20.000	19.000
BOD5,SOL,MG/L	14.000	19.000	14.000	24.000	19.000	--	--	--	--	--	--	--	--	--
COD,MG/L	103.000	104.000	123.000	125.000	112.000	82.000	120.000	111.000	--	77.000	112.000	98.000	86.000	68.000
COD,SOL,MG/L	--	--	69.000	90.000	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	7.000	45.000	26.000	45.000	34.000	17.000	28.000	26.000	37.000	40.000	43.000	35.000	18.000	21.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.050	7.100	7.000	7.200	7.200	7.100	7.100	6.700	6.800	7.000	7.200	7.100	7.200	7.100
TOTAL REMOVALS														
BOD5 REMOVED,%	67.669	76.216	77.640	77.073	76.543	83.889	84.699	83.133	79.670	83.974	82.659	76.415	82.759	84.677
COD REMOVED,%	68.976	68.675	70.073	62.006	56.379	73.633	75.000	72.993	--	75.081	70.984	62.595	86.870	87.500
TSS REMOVED,%	95.238	66.912	72.340	70.395	77.027	75.714	65.000	75.926	77.976	67.742	72.078	75.352	85.246	85.106
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.574	0.777	0.863	0.780	0.496	0.445	0.562	0.895	0.977	0.426	0.571	0.436	0.855	0.403
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	108.824	145.413	126.548	163.114	128.900	146.122	147.378	127.270	152.435	119.603	144.897	91.513	103.883	104.656
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VSS,MG/L	3037.512	2999.999	2350.000	3350.000	4167.043	5266.359	4199.996	2279.533	2499.939	4499.996	4065.222	3364.310	1948.176	4165.676
SVI,ML/GTSS	61.000	58.000	52.000	55.000	70.000	70.000	60.000	51.000	51.000	51.000	38.000	46.000	40.000	46.000
ZSV,FT/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEMPERATURE,C **	20.000	20.000	20.000	20.000	20.000	--	--	--	--	--	--	--	--	18.000
DETENTION TIME,HR	1.830	1.905	1.905	1.882	1.882	1.845	1.859	1.953	1.788	1.953	1.788	1.734	1.672	1.774
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	585.326	562.282	562.282	569.195	569.195	580.717	576.108	548.455	599.153	548.455	599.153	617.588	640.632	603.762
SOLIDS LOAD,LB/FT2/DAY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RECYCLE RATIO,(R)	18.843	20.082	20.098	35.692	43.960	33.175	25.600	21.311	20.300	24.403	21.823	21.955	21.978	22.603

** BASED ON RAW WASTEWATER FLOW ONLY

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APPENDIX A

DATE	12/10/71	12/11/71	12/12/71	12/13/71	12/14/71	12/15/71	12/16/71	12/17/71	12/18/71	12/19/71	12/20/71	12/21/71	12/22/71	12/23/71
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	12.900	12.600	13.500	12.500	11.700	12.100	12.300	11.800	12.530	12.400	13.100	12.400	12.600	12.700
BOD5,MG/L	153.000	129.000	146.000	152.000	132.000	176.000	173.000	146.000	165.000	207.000	165.000	167.000	166.000	190.000
BOD5,SOL,MG/L	38.000	42.000	57.000	94.000	100.000	67.000	53.000	66.000	81.000	55.000	69.000	59.000	42.000	67.000
COD,MG/L	516.000	512.000	465.000	334.000	489.000	365.000	395.000	--	--	--	352.000	517.000	767.000	404.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	126.000	105.000	91.000	173.000	138.000	182.000	169.000	142.000	113.000	208.000	136.000	415.000	138.000	185.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.600	7.000	6.700	6.900	7.300	7.200	--	--	7.200	7.200	7.300	7.400	7.500	7.300
EFFLUENT														
BOD5,MG/L	26.000	31.000	30.000	30.000	28.000	25.000	26.000	38.000	32.000	28.000	25.000	28.000	31.000	36.000
BOD5,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COD,MG/L	56.000	52.000	55.000	84.000	95.000	99.000	79.000	--	--	--	96.000	125.000	125.000	113.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TSS,MG/L	22.000	25.000	16.000	11.000	34.000	50.000	18.000	50.000	15.000	23.000	23.000	48.000	40.000	33.000
VSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.700	6.600	6.400	7.000	6.900	7.100	--	--	7.100	7.500	7.100	6.900	7.000	7.100
TOTAL REMOVALS														
BOD5 REMOVED,%	82.007	75.969	79.452	80.263	84.615	83.429	84.971	80.612	80.606	86.473	84.848	83.234	81.325	81.053
COD REMOVED,%	89.147	89.844	42.424	72.368	77.855	71.633	80.000	--	--	--	72.727	75.822	83.703	72.030
TSS REMOVED,%	82.540	76.852	82.418	93.529	75.362	72.527	88.750	64.789	86.364	88.942	83.088	77.674	71.014	82.162
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.476	0.317	0.626	0.607	0.589	0.497	0.676	0.587	0.532	0.646	0.842	0.787	0.887	0.817
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	127.161	104.720	126.987	122.412	137.192	136.425	137.095	149.008	132.882	165.372	139.260	133.416	134.757	155.464
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VSS,MG/L	4281.128	5299.996	3249.999	3230.673	3735.004	4396.996	3249.999	4066.818	4000.000	4099.996	2650.455	2717.046	2434.549	3049.999
SVI,ML/GTSS	47.000	43.000	38.000	43.000	42.000	45.000	40.500	41.000	41.000	41.000	32.000	37.000	49.000	35.000
ZSV,FT/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEMPERATURE,C **	14.000	18.000	18.000	18.000	18.000	17.000	18.000	17.000	17.000	16.000	17.000	17.000	16.000	17.000
DETENTION TIME,HR	1.802	1.845	1.722	1.859	1.986	1.921	1.890	1.970	1.859	1.874	1.774	1.874	1.845	1.830
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	594.544	583.717	622.197	576.108	539.237	557.673	566.891	543.846	576.138	571.500	603.762	571.500	580.717	585.326
SOLIDS LOAD,LB/FT2/DAY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SLUDGE WASTED														
SOLIDS WASTED,LB/HR ***	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RECYCLE RATIO,(R/Q)	22.248	18.675	14.543	16.856	19.632	16.240	15.041	15.746	14.456	13.452	12.511	11.734	11.968	13.984

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	12/24/71	12/25/71	12/26/71	12/27/71	12/28/71	12/29/71	12/30/71	12/31/71	1/ 1/72	1/ 2/72	1/ 3/72	1/ 4/72	1/ 5/72	1/ 6/72
INFLUENT WASTEWATER														
FLOW RATE(D),MGD	12.400	12.000	13.400	13.400	12.200	12.200	12.200	13.360	11.720	12.590	12.170	12.380	13.860	13.950
BOD5,MG/L	176.000	134.000	148.000	215.000	173.000	125.000	158.000	153.000	174.000	205.000	156.000	167.000	114.000	125.000
BOD5,SOL,MG/L	79.000	62.000	63.000	71.000	63.500	38.000	51.000	40.000	45.000	75.000	48.000	36.000	24.000	47.000
COD,MG/L	419.000	466.000	458.000	451.000	444.000	267.000	476.000	314.000	420.000	396.000	316.000	485.000	375.000	377.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	125.000	143.000	111.000	121.000	102.000	72.000
TSS,MG/L	176.000	163.000	186.000	126.000	135.000	125.000	162.000	124.000	142.000	102.000	118.000	230.000	165.000	44.000
VSS,MG/L	--	--	--	--	--	--	--	--	142.000	102.000	118.000	230.000	147.000	44.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.200	7.100	7.300	7.300	7.500	7.300	7.100	7.200	7.300	7.370	6.950	7.400	7.210	7.300
EFFLUENT														
BOD5,MG/L	32.000	33.000	30.000	37.000	29.000	35.000	35.000	41.000	36.000	44.000	43.000	34.000	32.000	33.000
BOD5,SOL,MG/L	--	--	--	--	--	--	--	--	12.000	13.000	17.000	7.000	8.000	13.000
COD,MG/L	109.000	105.000	90.000	101.000	115.000	82.000	99.000	67.000	132.000	119.000	138.000	43.000	140.000	94.000
COD,SOL,MG/L	--	--	--	--	--	--	--	--	58.000	68.000	71.000	69.000	81.000	30.000
TSS,MG/L	34.000	33.000	28.000	31.000	27.000	35.000	27.000	32.000	33.000	11.000	57.000	35.000	37.000	23.000
VSS,MG/L	--	--	--	--	--	--	--	--	33.000	11.000	55.000	35.000	37.000	23.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.100	7.000	7.100	7.300	7.400	6.900	7.100	6.800	6.830	6.920	6.970	6.900	7.120	7.300
TOTAL REMOVALS														
BOD5 REMOVED,%	81.818	82.065	84.043	82.791	83.237	72.000	77.848	73.203	79.310	78.537	72.436	79.641	71.930	73.600
COD REMOVED,%	73.986	77.468	81.920	77.605	74.099	69.288	79.202	78.662	68.571	69.949	56.329	91.134	62.667	75.066
TSS REMOVED,%	80.682	79.375	84.946	75.397	80.000	66.667	83.333	74.194	78.873	89.216	51.695	84.783	77.576	47.727
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.578	0.504	0.800	0.700	0.760	0.373	--	--	0.586	0.777	0.414	0.616	0.404	0.438
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	140.607	154.111	162.306	185.616	135.981	98.252	124.190	121.838	131.386	166.284	122.317	133.201	101.798	112.345
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	--	--	--	--	--	--	--	--	4266.996	4132.996	5594.992	4399.996	5394.992	4970.992
VSS,MG/L	3899.999	4099.996	3249.999	4249.996	2869.326	4218.867	--	--	3594.999	3430.000	4729.992	3465.999	4038.000	4110.996
SVI,ML/GTSS	31.000	31.500	32.000	36.000	34.000	33.000	34.000	35.000	35.350	32.150	41.200	36.750	34.850	34.500
ZSV,FT/HR	--	--	--	--	--	--	--	--	7.105	7.200	6.060	7.425	7.285	3.964
TEMPERATURE,C **	16.000	17.000	16.000	17.000	17.000	16.000	17.000	16.000	16.500	16.000	16.000	16.000	16.000	16.000
DETENTION TIME,HR	1.874	1.788	1.734	1.734	1.905	1.905	1.905	1.880	1.983	1.846	1.910	1.877	1.677	1.666
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	571.500	599.153	617.588	617.588	562.282	562.282	562.282	569.656	543.159	580.256	560.899	570.578	638.789	642.937
SOLIDS LOAD,LB/FT2/DAY	--	--	--	--	--	--	--	--	21.201	22.068	28.565	23.107	31.078	28.947
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	--	--	--	--	--	--	--	--	18030.000	25650.000	27500.000	25413.000	29675.000	29398.000
RECYCLE RATIO,(R)	15.532	14.982	14.329	13.612	14.107	14.525	14.533	15.210	14.889	14.932	13.689	14.960	12.633	13.125

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS (EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	1/ 7/72	1/ 8/72	1/ 9/72	1/10/72	1/11/72	1/12/72	1/13/72	1/14/72	1/15/72	1/16/72	1/17/72	1/18/72	1/19/72	1/20/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	12.770	12.280	12.230	12.590	12.620	12.850	12.260	12.510	12.650	12.230	12.210	11.960	11.910	12.000
BOD5,MG/L	136.000	179.000	182.000	145.000	--	255.000	270.000	256.000	189.000	165.000	184.000	188.000	265.000	148.000
BOD5,SOL,MG/L	63.000	57.000	44.000	53.000	--	58.000	55.000	52.000	48.000	52.000	49.000	58.000	61.000	41.000
COD,MG/L	397.000	430.000	460.000	352.000	--	375.000	295.000	323.000	353.000	272.000	282.000	320.000	408.000	439.000
COD,SOL,MG/L	130.000	154.000	97.000	84.000	--	62.000	140.000	169.000	198.000	94.000	47.000	94.000	133.000	72.000
TSS,MG/L	145.000	120.000	146.000	152.000	110.000	156.000	155.000	142.000	119.000	153.000	149.000	224.000	182.000	198.000
VSS,MG/L	123.000	120.000	146.000	152.000	103.000	47.000	138.000	135.000	118.000	119.000	133.000	192.000	166.000	165.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.270	6.970	7.200	7.300	6.900	7.100	7.000	11.065 7.260	--	--	--	--	--	--
EFFLUENT									7.230	7.190	6.920	7.330	7.040	7.210
BOD5,MG/L	15.000	47.000	44.000	45.000	--	50.000	55.000	55.000	53.000	53.000	47.000	42.000	45.000	36.000
BOD5,SOL,MG/L	16.000	15.000	30.000	17.000	--	24.000	23.000	23.000	22.000	20.000	14.000	21.000	14.000	13.000
COD,MG/L	137.000	170.000	127.000	132.000	--	78.000	163.000	162.000	133.000	149.000	141.000	160.000	137.000	145.000
COD,SOL,MG/L	59.000	68.000	79.000	64.000	--	39.000	62.000	46.000	57.000	66.000	136.000	48.000	55.000	55.000
TSS,MG/L	36.000	23.000	47.000	47.000	92.000	128.000	41.000	37.000	32.000	73.000	61.000	42.000	51.000	64.000
VSS,MG/L	27.000	23.000	47.000	42.000	81.000	39.000	35.000	37.000	32.000	61.000	59.000	31.000	42.000	44.000
NH3-N,MG/L	--	--	--	--	--	--	--	16.000	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	47.500	--	--	--	--	--	--
PH	7.080	6.860	7.200	7.200	7.000	7.000	6.900	7.040	6.960	6.950	6.830	6.930	6.780	6.950
TOTAL REMOVALS														
BOD5 REMOVED,%	88.971	73.743	75.824	68.965	--	80.392	79.630	78.516	71.958	67.879	74.457	77.660	83.019	75.676
COD REMOVED,%	65.491	60.465	72.391	62.500	--	79.200	44.746	49.845	62.857	45.221	50.000	50.000	66.422	66.970
TSS REMOVED,%	75.172	80.833	67.808	69.079	16.364	17.949	73.548	73.944	72.881	52.288	59.060	81.250	71.978	67.677
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.609	0.755	0.535	0.481	--	0.940	0.755	1.160	0.410	0.440	0.499	0.614	0.931	0.574
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	111.893	141.619	143.407	117.616	--	211.113	213.268	206.333	154.036	130.011	144.745	144.864	203.343	114.423
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3523.999	5747.992	5344.996	4754.996	4062.999	4400.996	5573.996	3458.000	7352.992	5667.996	5734.996	4614.996	4379.996	4059.999
VSS,MG/L	2942.999	3006.999	4297.992	3923.000	3433.000	3597.999	4525.996	2849.999	6022.992	4737.992	4652.996	3780.000	3500.000	3193.000
SVI,ML/GTSS	35.500	30.050	31.100	36.400	35.100	34.100	34.400	33.550	29.650	42.950	35.750	35.800	35.900	37.750
ZSV,FT/HR	13.915	8.740	7.065	5.800	7.240	8.600	7.255	--	6.240	6.030	7.755	7.945	8.765	9.530
TEMPERATURE,C **	16.000	16.000	16.000	16.000	16.000	14.000	15.000	15.000	12.000	14.000	15.000	15.000	15.000	15.000
DETENTION TIME,HR	1.820	1.893	1.900	1.846	1.842	1.809	1.896	1.858	1.837	1.900	1.903	1.943	1.951	1.937
FINAL SETTLE														
OVERFLOW,GAL/FT2/DAY	588.552	565.969	563.664	583.256	581.639	592.240	565.047	576.569	583.021	563.664	562.743	551.220	548.916	553.064
SOLIDS LOAD,LB/FT2/DAY	18.936	29.440	27.733	25.477	21.380	23.840	28.878	18.008	39.017	28.972	29.534	22.791	21.661	20.098
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	22350.000	31000.000	32900.000	32137.000	26400.000	38500.000	24875.000	26475.000	31700.000	30450.000	38475.000	25700.000	19538.000	26150.000
RECYCLE RATIO,(R)	14.033	13.029	14.971	15.330	12.995	14.241	14.519	12.614	13.676	13.262	14.309	11.898	12.927	11.792

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY SYSTEMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	1/21/72	1/22/72	1/23/72	1/24/72	1/25/72	1/26/72	1/27/72	1/28/72	1/29/72	1/30/72	1/31/72	2/ 1/72	2/ 2/72	2/ 3/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	11.440	12.430	12.490	12.660	12.650	11.950	12.524	12.200	12.550	12.400	11.540	10.520	12.360	11.280
BOD5,MG/L	179.000	164.000	143.000	183.000	189.000	217.000	199.000	166.000	173.000	216.000	190.000	228.000	196.000	164.000
BOD5,SOL,MG/L	49.000	66.000	46.000	65.000	45.000	71.000	72.000	52.000	37.000	83.000	52.000	42.000	152.000	30.000
COD,MG/L	352.000	441.000	366.000	455.000	388.000	392.000	314.000	314.000	374.000	443.000	384.000	377.000	437.000	390.000
COD,SOL,MG/L	--	285.000	95.000	220.000	78.000	172.000	204.000	102.000	114.000	427.000	194.000	135.000	117.000	117.000
TSS,MG/L	165.000	176.000	120.000	196.000	132.000	142.000	153.000	102.000	185.000	162.000	141.000	178.000	163.000	183.000
VSS,MG/L	147.000	170.000	120.000	196.000	132.000	146.000	153.000	102.000	180.000	161.000	137.000	159.000	145.000	145.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.990	6.970	7.230	7.180	7.320	7.300	7.400	7.500	7.400	7.020	7.090	7.180	7.070	7.200
EFFLUENT														
BOD5,MG/L	45.000	35.000	35.000	29.000	37.000	46.000	38.000	42.000	37.000	70.000	38.000	43.000	42.000	46.000
BOD5,SOL,MG/L	11.000	15.000	10.000	25.000	14.000	25.000	14.000	20.000	17.000	35.000	16.000	15.000	24.000	16.000
COD,MG/L	128.000	130.000	135.000	110.000	122.000	122.000	74.000	114.000	110.000	250.000	121.000	106.000	129.000	113.000
COD,SOL,MG/L	--	71.000	95.000	99.000	58.000	67.000	82.000	51.000	51.000	95.000	54.000	36.000	66.000	43.000
TSS,MG/L	41.000	32.000	23.000	29.000	19.000	34.000	25.000	30.000	23.000	131.000	14.000	39.000	36.000	15.000
VSS,MG/L	35.000	32.000	13.000	29.000	19.000	34.000	25.000	30.000	23.000	127.000	14.000	32.000	36.000	15.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.010	7.030	7.290	6.990	7.090	6.980	7.200	7.100	7.200	6.950	6.890	6.910	6.820	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	74.860	78.659	75.524	84.153	80.423	78.802	80.905	74.699	78.235	67.593	78.889	81.140	78.571	71.951
COD REMOVED,%	63.636	70.522	62.912	75.824	68.557	68.878	76.433	63.694	70.899	43.567	68.895	71.883	70.481	71.026
TSS REMOVED,%	75.152	81.818	80.833	85.204	85.606	77.027	83.660	70.588	87.222	19.136	90.071	78.090	77.914	91.667
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.383	0.399	0.395	0.689	0.684	0.518	0.622	0.405	0.581	0.747	0.539	0.804	0.485	0.456
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	131.932	131.337	115.072	149.264	154.524	167.070	160.569	130.479	136.908	172.563	133.829	154.533	156.079	119.186
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	--	--	--	--	--	7997.000	8496.000	6497.000	--	--	6497.000	5998.000	4998.000	4998.000
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--	--	--	--	0.946	1.015	1.034	--	--	0.958	0.708	0.635	0.907
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	6843.992	6614.992	5351.996	4254.996	4139.996	6292.992	4962.996	6270.992	4447.996	4344.996	4833.992	5611.996	6244.992	5024.992
VSS,MG/L	5514.996	5274.996	4664.996	3474.000	3594.999	5167.996	4135.996	5169.992	3776.000	3703.000	3978.999	4681.999	5154.996	4186.996
SVI,ML/GTSS	31.100	28.200	35.500	32.100	38.480	31.400	35.650	38.600	41.600	40.450	39.700	34.200	36.500	40.150
ZSV,FT/HR	13.350	8.295	4.000	7.845	6.080	7.460	7.140	5.630	6.010	6.310	7.280	12.250	5.700	5.890
TEMPERATURE,C **	15.000	15.000	15.000	15.000	15.000	15.000	16.000	16.000	16.000	15.000	15.000	15.000	15.000	15.000
DETENTION TIME,HR	2.032	1.870	1.861	1.836	1.831	1.945	1.852	1.905	1.859	1.874	2.014	2.209	1.880	2.060
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	527.254	572.892	575.647	583.482	584.865	550.760	577.208	562.282	576.198	571.500	531.863	484.853	569.656	519.880
SOLIDS LOAD,LB/FT2/DAY	33.980	34.227	27.728	22.449	22.031	31.820	25.985	32.345	22.906	22.111	23.439	24.861	31.757	23.465
SLUDGE WASTED														
*** SOLIDS WASTED,LB/HR	--	--	--	--	--	--	--	--	--	--	--	941.151	818.390	771.623
RETURN SLUDGE														
RECYCLE TSS,MG/L	25913.000	34575.000	29525.000	30625.000	30625.000	33763.000	29750.000	8225.000	26833.000	22913.000	27553.000	18125.000	33113.000	31000.000
RECYCLE RATIO,(%Q)	17.614	12.808	12.410	12.938	13.641	14.669	13.295	14.574	11.648	11.218	13.865	14.116	11.497	12.190

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	2/ 4/72	2/ 5/72	2/ 6/72	2/ 7/72	2/ 8/72	2/ 9/72	2/10/72	2/11/72	2/12/72	2/13/72	2/14/72	2/15/72	2/16/72	2/17/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	13.190	11.680	11.680	10.390	10.160	10.380	10.610	9.520	9.900	11.900	12.420	10.340	10.340	10.100
BOD5,MG/L	132.000	148.000	180.000	198.000	199.000	175.000	192.000	157.000	174.000	149.000	130.000	162.000	170.000	180.000
BOD5,SOL,MG/L	54.000	57.000	69.000	69.000	74.000	66.000	56.000	51.000	54.000	34.000	39.000	54.000	47.000	46.000
COD,MG/L	298.000	312.000	419.000	186.000	358.000	816.000	502.000	384.000	355.000	304.000	320.000	336.000	286.000	268.000
COD,SOL,MG/L	141.000	109.000	178.000	140.000	164.000	80.000	162.000	128.000	113.000	88.000	96.000	112.000	79.000	87.000
TSS,MG/L	126.000	112.000	120.000	149.000	121.000	136.000	140.000	158.000	98.000	139.000	111.000	110.000	126.000	143.000
VSS,MG/L	112.000	112.000	--	133.000	121.000	136.000	139.000	149.000	98.000	121.000	96.000	32.000	125.000	134.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.080	7.010	7.370	7.450	7.170	7.230	7.030	7.200	7.900	6.890	6.990	6.870	7.100	6.970
EFFLUENT														
BOD5,MG/L	40.000	32.000	33.000	39.000	34.000	32.000	31.000	33.000	33.000	33.000	42.000	34.000	29.000	33.000
BOD5,SOL,MG/L	29.000	20.000	12.000	26.000	24.000	17.000	22.000	13.000	10.000	13.000	10.000	12.000	11.000	13.000
COD,MG/L	99.000	109.000	128.000	116.000	140.000	132.000	126.000	112.000	97.000	108.000	96.000	116.000	99.000	87.000
COD,SOL,MG/L	77.000	59.000	124.000	78.000	106.000	41.000	89.000	64.000	48.000	48.000	48.000	40.000	48.000	47.000
TSS,MG/L	34.000	33.000	10.000	35.000	21.000	14.000	32.000	15.000	8.000	34.000	42.000	103.000	31.000	39.000
VSS,MG/L	29.000	33.000	--	28.000	21.000	14.000	26.000	9.000	6.000	32.000	32.000	32.000	31.000	29.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.870	6.570	7.020	7.050	6.820	7.170	6.850	6.900	6.800	6.910	6.600	6.670	7.000	6.730
TOTAL REMOVALS														
BOD5 REMOVED,%	69.697	78.378	81.667	80.303	82.915	81.714	83.854	78.981	81.461	77.852	67.692	79.012	82.941	81.667
COD REMOVED,%	66.779	65.064	69.451	37.634	60.894	83.824	74.900	70.833	72.676	64.474	70.000	65.476	65.385	67.537
TSS REMOVED,%	73.016	70.536	91.667	75.000	82.645	89.706	77.143	90.506	91.837	75.540	62.162	6.364	75.397	72.727
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.581	0.519	0.606	0.437	0.514	0.474	0.393	0.231	0.319	0.401	0.513	0.470	0.293	0.314
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	112.173	111.372	135.452	132.542	130.262	117.033	131.246	96.296	113.534	114.236	104.025	107.921	113.251	117.129
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5498.000	4998.000	7197.000	11991.000	12995.000	3998.000	6197.000	8496.000	7797.000	5498.000	6197.000	5698.000	4796.500	4118.000
O2 SUPPLIED/BOD REMOVED,LB/LB	1.091	0.891	1.013	1.760	1.880	0.653	0.880	1.745	1.317	0.966	1.365	1.044	0.795	0.673
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3823.999	4297.992	4484.996	5975.992	4892.996	4825.992	6414.992	8272.992	6990.988	5647.996	4026.000	4647.996	7537.988	8915.992
VSS,MG/L	3095.000	3462.999	3580.000	4857.992	4064.999	3960.000	5345.992	6684.992	5709.992	4567.996	3253.000	3677.999	6200.996	5573.996
SVI,ML/GTSS	38.850	42.600	39.000	41.600	41.800	40.200	41.350	57.000	67.200	43.700	42.800	39.800	44.050	69.000
ZSV,FT/HR	7.410	7.210	7.230	3.800	5.300	7.270	6.080	0.970	0.670	2.920	9.440	7.000	4.420	0.750
TEMPERATURE,C **	16.000	15.000	15.000	14.000	14.000	14.000	14.000	14.000	14.000	14.000	16.000	14.000	15.000	14.000
DETENTION TIME,HR	1.762	1.990	1.990	2.237	2.288	2.239	2.191	2.441	2.348	1.953	1.871	2.248	2.248	2.301
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	607.909	538.315	538.315	478.861	468.261	478.400	489.000	438.764	456.278	548.455	572.421	476.557	476.557	465.496
SOLIDS LOAD,LB/FT2/DAY	20.580	20.824	21.002	26.925	21.125	21.281	30.416	37.262	32.783	30.070	22.782	22.815	34.900	42.188
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	935.313	491.031	--	771.624	491.035	700.415	444.266	584.566	467.648	--	--	--	555.336	613.795
RETURN SLUDGE														
RECYCLE TSS,MG/L	33938.000	31025.000	26800.000	28588.000	24963.000	26713.000	29825.000	29026.000	22113.000	13548.000	9180.000	10973.000	28500.000	28162.000
RECYCLE RATIO,(RQ)	10.576	12.414	8.647	17.517	15.157	15.125	21.103	28.214	28.364	21.244	23.470	28.646	21.344	26.960

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	2/18/72	2/19/72	2/20/72	2/21/72	2/22/72	2/23/72	2/24/72	2/25/72	2/26/72	2/27/72	2/28/72	3/ 1/72	3/ 2/72	3/ 3/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.620	12.530	12.130	10.370	10.690	10.040	10.360	11.860	12.450	11.800	10.940	10.030	10.760	10.560
BOD5,MG/L	133.000	88.000	141.000	186.500	216.000	154.300	156.000	122.000	118.000	151.000	143.000	159.500	156.000	169.000
BOD5,SOL,MG/L	38.000	29.000	65.000	67.500	59.500	64.000	50.000	39.000	35.000	50.000	51.000	59.500	52.000	44.000
COD,MG/L	351.000	206.000	237.000	372.000	421.000	314.000	202.000	233.000	294.000	293.000	250.000	297.000	299.000	304.000
COD,SOL,MG/L	143.000	95.000	93.000	124.000	94.000	110.000	109.000	85.000	106.000	110.000	107.000	94.000	83.000	96.000
TSS,MG/L	116.000	72.000	118.000	124.000	153.000	102.000	102.000	92.000	193.000	89.000	89.000	110.000	96.000	86.000
VSS,MG/L	115.000	56.000	116.000	22.000	153.000	102.000	102.000	92.000	176.000	81.000	71.000	102.000	86.000	85.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.840	6.920	7.080	7.030	6.980	6.840	7.050	6.900	--	6.930	6.760	7.100	6.800	7.230
EFFLUENT														
BOD5,MG/L	27.000	23.000	22.000	18.750	22.600	34.300	40.000	25.000	19.000	24.000	20.000	15.800	15.000	30.000
BOD5,SOL,MG/L	8.000	6.000	14.000	9.600	17.400	17.900	10.900	5.000	8.000	12.000	12.500	8.000	12.900	16.000
COD,MG/L	112.000	76.000	70.000	93.000	156.000	67.000	129.000	93.000	81.000	83.000	69.000	71.000	75.000	68.000
COD,SOL,MG/L	88.000	40.000	52.000	54.000	51.000	59.000	43.000	43.000	54.000	40.000	46.000	43.000	59.000	56.000
TSS,MG/L	24.000	26.000	32.000	124.000	21.000	30.000	24.000	21.000	21.000	26.000	10.000	11.000	18.000	33.000
VSS,MG/L	20.000	26.000	28.000	22.000	21.000	30.000	24.000	21.000	21.000	24.000	8.000	13.000	15.000	32.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.660	6.810	6.800	6.750	6.700	6.750	--	6.800	--	6.740	6.710	6.800	6.750	6.959
TOTAL REMOVALS														
BOD5 REMOVED,%	79.699	73.864	84.397	89.946	89.537	77.771	74.359	79.508	83.898	84.106	86.014	90.094	90.385	82.143
COD REMOVED,%	68.091	63.107	70.464	75.000	62.945	78.662	36.139	60.086	72.449	67.194	72.400	76.094	74.916	77.632
TSS REMOVED,%	79.310	63.889	72.881	--	86.274	70.588	76.471	77.174	88.947	70.786	88.764	90.000	81.250	61.628
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.259	0.223	0.307	0.371	0.489	0.260	0.326	0.292	0.325	0.371	0.363	0.323	0.343	0.351
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	91.087	71.040	110.192	124.603	148.766	99.809	104.125	93.221	94.650	114.797	100.792	103.070	108.145	114.300
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	2957.500	4498.000	5498.000	5759.000	3043.000	4507.000	5583.500	4998.000	3998.000	4990.000	4670.000	5685.500	5034.000	4190.500
O2 SUPPLIED/BOD REMOVED,LB/LB	0.637	1.339	0.924	0.806	0.357	0.910	1.184	1.054	0.787	0.807	0.842	0.960	0.805	0.697
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	7637.992	6464.992	7477.992	6779.988	6079.992	7954.996	6557.988	6780.996	5874.996	6191.996	5719.996	6599.992	6513.992	6834.992
VSS,MG/L	5637.996	5097.988	5754.996	5389.996	4873.996	6147.992	5124.996	5124.996	4674.996	4965.992	4453.996	5110.996	5048.996	5214.996
SVI,ML/GTSS	72.500	39.500	37.450	61.450	60.780	72.000	37.200	42.050	38.650	43.550	43.800	46.800	44.200	42.800
ZSV,FT/HR	1.110	7.110	5.400	4.350	1.160	0.816	5.300	8.150	5.250	3.900	5.580	5.730	5.720	5.560
TEMPERATURE,C **	14.000	14.000	14.000	13.000	14.000	13.000	--	14.000	14.000	14.000	14.000	13.000	14.000	14.000
DETENTION TIME,HR	2.186	1.855	1.916	2.241	2.174	2.315	2.243	1.960	1.867	1.970	2.124	2.317	2.160	2.201
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	489.923	577.491	559.055	477.939	492.688	462.730	477.478	546.611	573.804	543.846	504.210	462.269	495.814	486.696
SOLIDS LOAD,LB/FT2/DAY	37.294	36.118	40.530	32.554	29.595	36.966	30.503	36.492	32.449	32.761	28.355	31.103	32.498	33.726
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	1227.583	584.566	--	584.567	866.398	859.308	900.233	1075.595	491.032	--	584.565	659.316	613.787	1028.827
RETURN SLUDGE														
RECYCLE TSS,MG/L	29925.000	25725.000	25675.000	27078.000	26000.000	29575.000	33663.000	29012.000	29237.000	26838.000	25500.000	26387.000	26050.000	29387.000
RECYCLE RATIO,(%Q)	24.478	23.830	21.088	25.477	23.396	25.428	21.670	22.968	20.225	21.508	22.797	27.328	25.651	26.629

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	3/ 4/72	3/ 5/72	3/ 6/72	3/ 7/72	3/ 8/72	3/ 9/72	3/10/72	3/11/72	3/12/72	3/13/72	3/14/72	3/15/72	3/16/72	3/17/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	11.520	10.560	10.580	10.170	9.730	11.300	11.910	11.580	11.300	11.720	11.000	10.770	11.090	12.170
BOD5,MG/L	163.000	--	138.500	143.500	135.700	159.000	222.500	125.000	127.000	162.000	148.000	178.500	220.000	143.000
BOD5,SOL,MG/L	50.000	--	38.000	53.200	50.200	51.800	58.000	46.000	31.533	38.503	44.000	66.000	66.300	60.500
COD,MG/L	320.000	331.000	320.000	282.000	433.000	290.000	189.000	329.000	349.000	392.000	378.000	462.000	434.000	308.000
COD,SOL,MG/L	140.000	158.000	195.000	110.000	93.000	166.000	142.000	110.000	111.000	110.000	95.000	123.000	200.000	85.000
TSS,MG/L	102.000	129.030	154.000	79.000	124.700	184.000	132.000	104.000	104.000	134.000	113.000	154.000	182.000	80.000
VSS,MG/L	102.000	120.000	104.000	--	124.000	184.000	132.000	96.000	96.000	134.000	96.000	152.000	138.000	80.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.300	6.890	6.900	6.900	6.900	7.000	7.100	7.000	7.030	6.900	7.200	6.900	7.100	6.950
EFFLUENT														
BOD5,MG/L	26.000	--	9.650	10.000	11.500	11.500	14.500	10.000	11.500	9.500	15.000	15.000	16.700	15.000
BOD5,SOL,MG/L	15.000	--	9.500	9.800	7.500	7.600	10.000	8.000	8.500	7.000	6.000	7.700	9.700	8.500
COD,MG/L	80.000	75.000	64.000	63.000	58.000	78.000	63.000	78.000	64.000	59.000	83.000	89.000	96.000	77.000
COD,SOL,MG/L	44.000	47.000	53.000	41.000	16.000	39.000	47.000	78.000	44.000	57.000	67.000	50.000	58.000	43.000
TSS,MG/L	26.000	25.000	18.000	--	26.000	33.000	13.000	13.000	12.000	8.000	19.000	26.000	29.000	6.000
VSS,MG/L	26.000	25.000	10.000	--	26.000	33.000	13.000	13.000	12.000	8.000	18.000	25.000	22.000	6.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	6.690	6.900	6.900	7.000	6.800	6.900	6.800	6.900	6.960	7.300	6.800	6.900	6.860
TOTAL REMOVALS														
BOD5 REMOVED,%	84.049	--	93.032	93.031	91.525	92.767	93.483	92.000	90.945	94.136	89.865	91.597	92.409	89.510
COD REMOVED,%	75.000	77.341	80.000	77.660	75.107	73.103	66.667	76.252	81.662	84.949	78.042	80.736	77.880	75.000
TSS REMOVED,%	74.510	79.167	88.312	100.000	79.032	82.065	90.152	87.500	88.462	94.030	82.727	83.117	84.066	92.500
BIOMASS LOADING														
BOD5/DAY/#LVSS	0.338	--	0.296	0.284	0.276	0.360	0.636	0.324	0.330	0.418	0.336	0.391	0.489	0.414
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	121.084	--	94.407	94.025	85.068	115.757	170.731	93.259	92.460	122.325	104.888	123.858	157.198	112.124
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4498.000	4498.000	5091.500	5137.000	4665.000	5056.500	3973.500	4733.000	4856.500	5297.500	4752.000	5451.500	4921.500	4944.500
O2 SUPPLIED/BOD REMOVED,LB/LB	0.691	9105.508	0.906	0.921	0.980	0.738	0.409	0.901	0.902	0.719	0.790	0.726	0.531	0.770
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	7529.992	--	6651.992	6707.996	6160.992	6272.957	5135.996	5939.992	5747.992	5979.996	6445.996	6476.988	6531.996	5623.992
VSS,MG/L	5746.992	--	5210.996	5301.992	4931.996	5154.996	4303.996	4619.996	4684.996	4684.996	5000.996	5071.992	5154.996	4339.996
SVI,ML/GTSS	57.900	--	39.700	37.500	47.700	43.600	47.850	55.560	49.630	52.000	59.300	48.500	48.000	56.800
ZSV,FT/HR	2.990	--	2.800	10.100	9.950	8.800	10.100	3.160	5.500	7.270	9.100	9.290	6.920	9.560
TEMPERATURE,C **	14.000	14.000	14.000	13.000	13.000	13.000	--	13.000	14.000	14.000	13.000	13.000	13.000	14.000
DETENTION TIME,HR	2.016	2.201	2.197	2.285	2.389	2.057	1.951	2.007	2.057	1.983	2.113	2.158	2.096	1.910
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	531.402	486.696	487.618	468.722	448.443	520.802	548.916	533.797	520.902	540.159	506.975	496.375	511.123	560.895
SOLIDS LOAD,LB/FT2/DAY	39.734	--	33.555	32.156	28.509	32.939	27.996	31.747	33.138	32.387	34.542	34.558	35.297	32.621
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	695.151	--	--	806.704	982.069	736.553	1028.837	--	--	982.070	859.305	736.552	982.069	584.585
RETURN SLUDGE														
RECYCLE TSS,MG/L	23500.000	24475.000	23138.000	2527	00	23062.000	21025.000	24375.000	27238.000	26125.000	--	29327.000	22312.000	23838.000
RECYCLE RATIO,FRCN	24.024	25.379	29.206	2	29	28.880	25.929	24.030	25.076	24.752	25.230	32.018	34.253	32.047	29.162

** BASED ON AERATED INFLUENT FLOW ONLY

*** WASTING RATE IS MIXED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	3/18/72	3/19/72	3/20/72	3/21/72	3/22/72	3/23/72	3/24/72	3/25/72	3/26/72	3/27/72	3/28/72	3/29/72	3/30/72	3/31/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	11.680	11.420	11.610	11.310	11.190	11.060	11.190	11.190	11.260	10.900	10.810	10.760	10.500	10.370
BOD5,MG/L	159.000	173.000	109.000	158.000	162.500	134.000	168.000	181.000	163.000	173.000	188.000	187.500	192.000	146.000
BOD5,SOL,MG/L	37.000	58.000	38.000	45.500	60.500	61.000	57.000	51.000	61.000	64.500	69.000	55.000	53.000	31.000
COD,MG/L	290.000	318.000	360.000	295.000	376.000	318.000	541.000	380.000	365.000	405.000	273.000	305.000	303.000	256.000
COD,SOL,MG/L	85.000	151.000	167.000	66.000	137.000	100.000	183.000	132.000	116.000	101.000	64.000	80.000	96.000	80.000
TSS,MG/L	150.000	132.000	144.000	166.000	122.000	100.000	116.000	192.000	156.000	126.000	172.000	140.000	138.000	146.000
VSS,MG/L	150.000	132.000	110.000	166.000	122.000	100.000	114.000	132.000	132.000	126.000	136.000	140.000	138.000	146.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.200	7.100	7.000	7.000	7.000	7.000	7.100	6.940	6.980	7.040	7.220	7.000	7.080
EFFLUENT														
BOD5,MG/L	42.000	15.500	16.500	17.000	18.400	49.750	20.000	18.000	12.500	15.800	23.000	18.500	17.000	64.000
BOD5,SOL,MG/L	12.000	8.500	7.600	6.300	12.000	14.300	12.000	10.000	7.100	10.000	13.600	10.600	9.000	21.000
COD,MG/L	120.000	75.000	88.000	94.000	103.000	205.000	108.000	83.000	104.000	80.000	76.000	84.000	76.000	148.000
COD,SOL,MG/L	56.000	54.000	60.000	37.000	90.000	67.000	79.000	54.000	46.000	46.000	32.000	40.000	32.000	60.000
TSS,MG/L	21.000	30.000	52.000	14.000	28.000	70.000	22.000	32.000	18.000	17.000	29.000	28.000	22.000	93.000
VSS,MG/L	21.000	30.000	21.000	14.000	28.000	70.000	20.000	24.000	15.000	17.000	25.000	28.000	22.000	93.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.750	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.760	6.910	6.770	7.190	7.000	6.980
TOTAL REMOVALS														
BOD5 REMOVED,%	73.585	91.040	84.862	89.240	88.677	62.873	88.095	90.055	92.351	90.867	87.766	90.133	91.146	56.164
COD REMOVED,%	58.621	76.415	70.667	68.136	72.606	35.535	80.037	78.158	71.507	80.247	72.161	72.459	74.917	42.188
TSS REMOVED,%	86.000	77.273	73.196	91.566	77.049	30.000	81.034	83.333	89.462	86.508	83.140	80.000	84.058	36.301
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.436	0.467	0.270	0.417	0.361	0.335	0.357	0.422	0.371	0.418	0.400	0.396	0.388	0.292
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	121.698	127.287	81.532	115.131	117.153	95.484	121.118	130.374	118.039	121.491	130.935	129.982	129.886	97.544
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	3998.000	4932.000	5145.945	5280.500	6457.500	5286.500	5330.500	5586.500	5528.530	5854.500	6103.848	5521.000	6209.000	4998.000
O2 SUPPLIED/BOD REMOVED,LB/LB	0.698	0.665	1.162	0.800	0.941	1.381	0.783	0.743	0.793	0.829	0.830	0.734	0.819	1.425
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5722.992	5534.996	6073.996	5650.992	6254.992	5619.996	6389.992	6309.992	6480.992	5924.992	6611.992	6685.992	6764.996	6774.996
VSS,MG/L	4477.996	4371.996	4839.996	4421.992	5207.992	4569.996	5437.992	4953.996	5094.996	4658.996	5251.992	5454.992	5358.992	5354.996
SVI,ML/GTSS	61.400	23.800	57.300	53.100	53.600	63.000	21.400	78.700	88.830	54.400	56.200	94.900	83.100	69.900
DO,MG/L	3.600	1.850	8.790	8.900	8.510	10.600	5.880	1.100	0.420	4.440	4.360	3.980	2.940	1.370
TEMPERATURE,C **	14.000	14.000	14.000	15.000	14.000	13.000	13.000	14.000	14.000	14.000	14.000	15.000	14.000	14.000
DETENTION TIME,HR	1.956	2.035	2.002	2.055	2.077	2.101	2.077	2.079	2.068	2.132	2.150	2.160	2.213	2.241
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	547.553	526.333	535.[illegible]	521.263	515.732	509.761	515.732	515.271	513.[illegible]47	502.[illegible]16	498.219	495.914	483.931	477.939
SOLIDS LOAD,LB/FT2/DAY	32.691	30.718	34.272	31.302	34.652	30.537	34.857	34.551	35.610	31.[illegible]65	34.990	35.303	34.704	26.654
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	--	--	441.034	467.652	--	150.916	672.250	--	--	859.310	675.172	--	876.847	643.021
RETURN SLUDGE														
RECYCLE TSS,MG/L	22575.000	23133.333	15866.000	23412.000	16738.000	21712.000	21112.000	22725.000	22775.333	23350.000	23825.000	[illegible]8.000	23950.000	23988.000
RECYCLE RATIO,(R)	30.303	31.699	31.705	32.723	34.164	33.137	32.109	32.728	32.473	30.460	32.664	32.983	32.400	2.813

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING MISC LOSSES)

APPENDIX A

DATE	4/ 1/72	4/ 2/72	4/ 3/72	4/ 4/72	4/ 5/72	4/ 6/72	4/ 7/72	4/ 8/72	4/ 9/72	4/10/72	4/11/72	4/12/72	4/13/72	4/14/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	11.620	10.280	10.240	10.290	10.250	10.230	10.640	10.620	11.150	10.660	10.750	10.360	11.120	11.680
BOD5,MG/L	178.000	187.000	175.000	187.000	192.000	187.500	150.000	101.000	178.000	182.000	159.000	157.000	133.000	134.000
BOD5,SOL,MG/L	50.000	71.000	86.000	71.000	62.000	85.500	55.000	36.000	63.500	57.500	58.000	57.000	53.000	53.000
COD,MG/L	238.000	432.000	375.000	417.000	412.000	415.000	474.000	367.000	437.000	402.000	332.000	386.000	398.000	392.000
COD,SOL,MG/L	79.000	112.000	139.000	159.000	159.000	140.000	123.000	96.000	149.000	262.000	114.000	140.000	104.000	131.000
TSS,MG/L	136.000	168.000	134.000	173.000	496.000	146.000	102.000	162.000	168.000	168.000	168.000	127.000	144.000	140.000
VSS,MG/L	110.000	--	110.000	149.000	482.000	146.000	28.000	118.000	168.000	162.000	116.000	124.000	138.000	101.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.880	6.900	7.100	6.980	6.660	6.950	7.200	7.100	7.000	7.240	7.100	7.200	7.200	6.940
EFFLUENT														
BOD5,MG/L	21.000	13.000	27.800	17.400	18.250	18.100	25.000	53.000	18.000	14.250	21.800	15.700	19.500	11.000
BOD5,SOL,MG/L	8.000	11.000	14.100	12.800	14.000	9.600	11.000	36.000	6.800	8.600	10.200	10.600	8.000	8.000
COD,MG/L	75.000	--	139.000	85.000	48.000	84.000	118.000	161.000	122.000	83.000	92.000	105.000	87.000	86.000
COD,SOL,MG/L	32.000	32.000	96.000	49.000	53.000	39.000	48.000	52.000	52.000	48.000	48.000	48.000	43.000	41.000
TSS,MG/L	23.000	10.000	57.000	26.000	24.000	22.000	24.000	136.000	52.000	30.000	58.000	31.000	44.000	16.000
VSS,MG/L	20.000	--	50.000	23.000	16.000	22.000	8.000	77.000	52.000	30.000	39.000	27.000	37.000	9.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.840	6.800	6.900	6.790	6.740	6.770	6.800	6.700	6.800	6.970	7.200	6.800	6.800	6.980
TOTAL REMOVALS														
BOD5 REMOVED,%	88.202	93.048	84.114	90.695	90.495	90.347	83.333	47.525	89.838	92.170	86.289	90.000	85.338	91.791
COD REMOVED,%	68.487	100.000	62.933	80.815	88.350	79.952	75.105	56.131	72.082	79.353	72.289	72.798	78.141	78.061
TSS REMOVED,%	83.088	94.048	57.463	84.971	91.892	84.932	76.471	14.815	69.048	82.143	65.476	75.591	73.171	88.571
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.442	0.357	0.343	0.364	0.464	0.407	0.345	0.232	0.403	0.458	0.381	0.336	0.339	0.359
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	133.259	123.853	115.454	123.973	126.793	123.580	102.826	70.408	127.869	127.342	110.123	104.793	95.286	100.837
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	7301.000	5998.000	5924.000	4997.000	5123.000	6168.500	5285.500	6259.000	5576.000	5474.500	5651.500	5639.000	5133.500	5687.500
O2 SUPPLIED/BOD REMOVED,LB/LB	0.971	0.813	0.950	0.694	0.698	0.863	0.960	2.912	0.758	0.729	0.926	0.931	0.983	0.957
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5848.992	7101.993	6773.992	6853.992	5579.992	6113.992	6148.992	6073.992	6355.988	5294.996	5912.996	6388.988	5818.996	5767.992
VSS,MG/L	4833.992	5557.992	5390.992	5464.996	4278.996	4862.992	4772.996	4973.996	5390.992	4440.996	4633.996	5034.992	4505.996	4497.992
SVI,ML/GTSS	75.400	67.900	59.103	54.500	50.900	51.500	58.000	58.800	58.500	59.300	42.500	74.900	50.300	50.900
ISV,FT/HR	5.370	6.560	4.610	4.800	5.690	4.810	4.780	0.580	0.230	4.610	5.640	4.940	4.950	6.660
TEMPERATURE,C **	14.000	14.000	15.000	14.000	14.300	14.000	15.000	15.000	14.500	14.000	15.000	15.000	15.000	15.000
DETENTION TIME,HR	2.000	2.261	2.279	2.259	2.267	2.272	2.184	2.148	2.084	2.149	2.162	2.243	2.090	1.990
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	535.550	473.792	471.948	474.252	472.409	471.487	490.384	498.679	513.848	500.523	495.453	477.478	512.506	538.315
SOLIDS LOAD,LB/FT2/DAY	32.612	36.034	34.462	33.941	26.500	28.540	30.507	30.427	32.057	26.573	29.164	30.596	29.675	30.400
SLUDGE WASTED														
*** SOLIDS WASTED,LB/HR	--	--	--	876.847	--	1262.653	1402.951	876.847	--	--	818.393	859.310	771.625	941.149
RETURN SLUDGE														
RECYCLE TSS,MG/L	20175.000	23125.000	22450.000	24562.000	20875.000	26300.000	28363.000	25613.000	24713.000	22700.000	26033.000	27330.000	27500.000	28125.000
RECYCLE RATIO,(RQ)	30.034	33.795	34.639	30.418	25.561	23.656	26.363	25.529	22.583	25.230	24.335	25.270	24.281	22.266

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	4/15/72	4/16/72	4/17/72	4/18/72	4/19/72	4/20/72	4/21/72	4/22/72	4/23/72	4/24/72	4/25/72	4/26/72	4/27/72	4/28/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.940	10.940	11.420	11.130	10.330	10.150	10.130	11.360	12.000	11.360	11.200	10.860	10.810	10.450
BOD5,MG/L	112.000	164.000	159.000	161.000	162.000	159.000	158.000	--	126.000	127.500	139.500	134.000	147.500	192.000
BOD5,SOL,MG/L	34.000	62.500	59.000	59.000	54.000	54.000	46.000	--	43.500	48.000	37.500	32.000	44.500	53.000
COD,MG/L	232.000	298.000	217.000	344.000	295.000	333.000	422.000	311.000	423.000	287.000	220.000	499.000	377.000	511.000
COD,SOL,MG/L	109.000	110.000	109.000	125.000	109.000	158.000	94.000	86.000	78.000	63.000	78.000	94.000	204.000	93.000
TSS,MG/L	99.000	158.000	154.000	130.000	112.000	158.000	160.000	124.000	135.000	112.000	86.000	114.000	126.000	110.000
VSS,MG/L	95.000	158.000	122.000	106.000	110.000	112.000	128.000	115.000	131.000	112.000	78.000	80.000	116.000	92.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.300	6.900	6.900	7.200	6.970	7.020	7.000	7.100	6.860	6.940	7.200	7.100	6.980	7.100
EFFLUENT														
BOD5,MG/L	14.000	15.000	21.000	20.000	25.000	27.000	20.000	--	21.000	18.500	19.500	20.000	18.000	23.000
BOD5,SOL,MG/L	10.000	4.000	12.000	17.000	12.000	16.000	12.000	--	15.000	9.000	15.500	12.000	16.500	12.000
COD,MG/L	78.000	63.000	47.000	98.000	74.000	170.000	86.000	89.000	75.000	94.000	71.000	78.000	90.000	78.000
COD,SOL,MG/L	39.000	39.000	43.000	47.000	39.000	47.000	35.000	43.000	31.000	39.000	31.000	39.000	75.000	51.000
TSS,MG/L	21.000	31.000	31.000	54.000	31.000	62.000	25.000	30.000	49.000	47.000	28.000	28.000	15.000	15.000
VSS,MG/L	21.000	31.000	25.000	38.000	31.000	52.000	16.000	30.000	43.000	47.000	23.000	18.000	15.000	12.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.040	7.000	6.900	6.900	6.930	6.900	6.900	6.800	6.910	6.750	7.200	6.900	6.970	6.850
TOTAL REMOVALS														
BOD5 REMOVED,%	87.500	90.854	86.792	87.578	84.568	83.019	87.342	--	83.333	85.490	86.021	85.075	87.797	88.021
COD REMOVED,%	66.379	78.859	78.341	71.512	74.915	48.949	79.621	71.383	82.270	66.784	67.727	73.826	76.127	74.920
TSS REMOVED,%	78.784	80.380	79.870	54.462	72.321	60.759	84.375	75.806	63.704	58.036	67.442	75.439	87.500	86.364
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.273	0.372	0.427	0.406	0.348	0.329	0.308	--	0.379	0.347	0.474	0.418	0.447	0.568
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	78.942	115.591	116.986	115.450	107.817	103.976	103.119	--	97.414	93.317	100.662	93.757	102.728	129.267
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5498.000	5498.000	6138.000	7045.000	6401.500	7398.000	7297.000	6780.000	6152.000	5749.500	5784.500	5764.000	6591.000	6245.000
O2 SUPPLIED/BOD REMOVED,LB/LB	1.239	0.815	0.941	1.085	1.179	1.330	1.261	13725.070	1.180	1.122	1.040	1.125	1.134	0.852
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5970.992	6350.988	5643.992	5833.996	6302.992	6447.992	6523.992	5705.996	5338.992	5693.992	4463.996	4753.996	4954.996	4835.992
VSS,MG/L	4634.996	4973.996	4388.996	4554.992	4967.992	5063.996	5365.992	4315.996	4124.996	4307.996	3403.999	3594.000	3684.998	3645.999
SVI,ML/GTSS	57.800	57.300	47.600	43.600	43.500	50.500	45.100	48.700	46.300	46.300	41.400	41.500	43.100	43.100
ZSV,FT/HR	3.110	3.430	7.600	6.420	5.040	6.170	4.420	0.720	0.700	7.500	8.370	8.600	9.000	10.000
TEMPERATURE,C **	15.000	15.000	15.000	15.000	15.000	16.000	15.000	14.000	15.000	15.000	15.000	15.000	16.000	16.000
DETENTION TIME,HR	2.124	2.124	2.035	2.088	2.250	2.290	2.294	2.046	1.937	2.046	2.075	2.140	2.150	2.224
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	504.210	534.210	526.333	512.967	476.056	467.800	466.878	523.567	553.064	523.567	516.193	500.523	498.219	481.626
SOLIDS LOAD,LB/FT2/DAY	29.833	31.825	29.253	29.958	30.103	30.639	30.335	29.170	28.949	28.644	20.953	21.853	22.438	20.914
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	1227.584	--	1262.661	1943.296	1029.835	1157.438	900.233	1028.832	--	1028.831	1104.827	955.333	613.789	771.628
RETURN SLUDGE														
RECYCLE TSS,MG/L	26700.000	26813.000	26125.000	27525.000	26975.000	25588.000	26950.000	25488.000	26553.000	29400.000	31313.000	27763.000	31013.000	34275.000
RECYCLE RATIO,(RQ)	23.766	24.132	22.995	24.034	25.295	26.867	24.393	21.954	22.450	20.009	13.571	14.705	13.525	12.153

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	4/29/72	4/30/72	5/ 1/72	5/ 2/72	5/ 3/72	5/ 4/72	5/ 5/72	5/ 6/72	5/ 7/72	5/ 8/72	5/ 9/72	5/10/72	5/11/72	5/12/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.840	9.870	11.030	10.990	11.110	11.960	11.440	11.140	10.830	10.810	11.690	11.250	11.040	11.010
BOD5,MG/L	121.000	145.000	159.500	134.500	127.000	157.000	134.000	137.000	161.000	184.000	148.000	187.500	206.500	137.000
BOD5,SOL,MG/L	32.000	48.500	53.500	52.000	49.000	38.000	44.000	44.000	59.500	77.000	56.500	64.000	70.000	53.000
COD,MG/L	226.000	337.000	414.000	207.000	315.000	268.000	318.000	288.000	329.000	345.000	336.000	340.000	400.000	319.000
COD,SOL,MG/L	145.000	96.000	112.000	48.000	126.000	110.000	142.000	80.000	110.000	94.000	128.000	81.000	80.000	128.000
TSS,MG/L	95.000	152.000	180.000	132.000	134.000	176.000	142.000	166.000	158.000	176.000	156.000	152.000	200.000	126.000
VSS,MG/L	80.000	152.000	180.000	132.000	134.000	176.000	124.000	102.000	124.000	144.000	128.000	126.000	74.000	126.000
NH3-N,MG/L	—	—	—	—	—	—	—	—	—	—	—	—	—	—
NO3-N,MG/L	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PH	6.890	7.100	7.300	7.200	7.000	7.100	7.200	7.000	6.900	7.000	7.100	7.100	7.000	7.000
EFFLUENT														
BOD5,MG/L	20.000	18.000	18.500	17.500	11.000	12.500	12.000	13.000	18.500	18.000	16.500	14.000	19.500	11.000
BOD5,SOL,MG/L	11.000	11.500	12.500	13.500	8.000	10.500	12.000	13.000	11.000	12.500	11.500	11.000	11.000	7.000
COD,MG/L	77.000	68.000	63.000	64.000	67.000	63.000	67.000	48.000	71.000	75.000	76.000	77.000	92.000	77.000
COD,SOL,MG/L	48.000	44.000	60.000	40.000	39.000	55.000	55.000	36.000	47.000	46.000	48.000	36.000	44.000	48.000
TSS,MG/L	20.000	12.000	17.000	24.000	17.000	16.000	16.000	24.000	27.000	26.000	26.000	22.000	47.000	8.000
VSS,MG/L	18.000	12.000	17.000	24.000	17.000	16.000	15.000	20.000	22.000	19.000	20.000	19.000	24.000	8.000
NH3-N,MG/L	—	—	—	—	—	—	—	—	—	—	—	—	—	—
NO3-N,MG/L	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PH	6.820	6.900	7.000	7.000	7.100	6.900	6.900	6.900	6.600	6.770	6.800	6.800	6.800	6.700
TOTAL REMOVALS														
BOD5 REMOVED,%	83.471	87.586	88.401	86.989	91.339	92.038	91.045	90.511	88.509	90.217	88.851	92.533	90.557	91.971
COD REMOVED,%	65.929	79.822	84.783	69.082	78.730	76.493	78.931	83.333	78.419	78.261	77.381	77.353	77.000	75.862
TSS REMOVED,%	78.947	92.105	90.556	81.818	87.313	90.909	88.732	85.542	82.911	85.227	83.333	85.526	76.500	93.651
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.351	0.344	0.507	0.465	0.444	0.595	0.498	0.389	0.355	0.465	0.426	0.499	0.621	0.411
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	84.506	92.205	113.346	95.234	90.905	120.977	98.765	98.328	112.338	128.149	111.467	135.902	146.879	97.180
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	6221.000	6634.500	7335.000	7297.500	6965.500	7177.000	7400.000	6523.000	7016.000	8940.000	6810.500	7684.000	6807.000	7393.500
O2 SUPPLIED/BOD REMOVED,LB/LB	1.373	1.279	1.136	1.367	1.302	0.997	1.277	1.137	1.095	1.200	1.067	0.945	0.791	1.279
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5064.992	5677.996	4584.996	4144.996	4084.999	3945.999	3843.999	5360.996	5918.992	5810.992	5559.996	5755.992	5098.992	5039.996
VSS,MG/L	3860.000	4289.996	3582.999	3284.999	3284.000	3257.999	3180.000	4055.000	5044.992	4414.996	4194.996	4360.996	3788.999	3791.000
SVI,ML/GTSS	41.300	42.300	—	41.000	41.000	—	44.900	46.500	42.600	47.300	49.100	46.200	51.400	45.100
ZSV,FT/HR	7.000	6.560	9.130	10.130	9.100	11.000	9.150	4.290	4.660	4.400	4.800	5.350	5.840	5.900
TEMPERATURE,C **	15.000	15.000	16.000	16.000	16.000	17.000	16.000	16.000	16.000	16.000	16.000	17.000	17.000	17.000
DETEATION TIME,HR	2.144	2.355	2.107	2.115	2.092	1.943	2.032	2.086	2.146	2.150	1.988	2.066	2.105	2.111
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	499.601	454.895	508.358	506.514	512.045	551.220	527.254	513.428	499.140	498.219	538.776	518.498	508.819	507.436
SOLIDS LOAD,LB/FT2/DAY	22.884	23.341	20.744	18.339	18.218	18.676	18.019	25.602	27.778	27.232	27.874	28.071	23.807	23.411
SLUDGE WASTED														
*** SOLIDS WASTED,LB/HR	1104.825	95.226	1367.882	982.065	1198.385	876.847	859.314	876.847	--	1169.123	1063.905	982.077	759.934	1215.894
RETURN SLUDGE														
RECYCLE TSS,MG/L	30713.000	27400.000	35880.000	27625.000	29750.000	23363.000	28563.000	27525.000	26938.000	26400.000	25689.000	24300.000	25925.000	25375.000
RECYCLE RATIO,(%Q)	12.952	12.867	11.160	9.099	8.785	7.241	11.040	16.176	17.433	17.404	16.219	17.476	14.611	14.332

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	5/13/72	5/14/72	5/15/72	5/16/72	5/17/72	5/18/72	5/19/72	5/20/72	5/21/72	5/22/72	5/23/72	5/24/72	5/25/72	5/26/72
INFLUENT WASTEWATER														
FLOW RATE(MGD),MGD	11.040	10.850	10.923	12.680	11.360	11.030	11.550	12.350	11.490	11.860	11.070	11.230	10.730	10.570
BOD5,MG/L	148.000	170.000	164.500	180.000	195.500	170.500	146.000	140.000	152.000	125.000	152.000	150.000	145.000	144.000
BOD5,SOL,MG/L	45.000	51.000	51.000	52.500	42.000	47.500	43.000	42.000	73.000	41.000	62.000	50.000	35.000	30.000
COD,MG/L	285.000	361.000	394.000	315.000	361.000	298.000	320.000	288.000	367.000	302.000	286.000	326.000	351.000	268.000
COD,SOL,MG/L	63.000	110.000	142.000	79.000	141.000	78.000	96.000	80.000	96.000	111.000	79.000	93.000	112.000	63.000
TSS,MG/L	136.000	220.000	224.000	150.000	128.000	158.000	120.000	168.000	108.000	128.000	122.000	126.000	100.000	106.000
VSS,MG/L	112.000	--	24.000	150.000	128.000	158.000	102.000	128.000	90.000	114.000	100.000	114.000	96.000	106.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.130	7.000	7.200	7.100	7.120	--	6.900	7.000	6.900	7.100	7.000	7.100	7.100	7.200
EFFLUENT														
BOD5,MG/L	13.000	16.000	16.500	15.000	19.000	18.000	13.000	16.000	12.000	15.000	9.000	9.000	6.000	5.000
BOD5,SOL,MG/L	6.000	12.500	14.000	10.500	14.000	12.000	13.000	15.000	9.300	7.000	8.000	7.000	5.000	4.000
COD,MG/L	67.000	71.000	98.000	79.000	67.000	94.000	72.000	60.000	72.000	79.000	48.000	39.000	56.000	28.000
COD,SOL,MG/L	28.000	56.000	79.000	11.000	43.000	51.000	60.000	24.000	68.000	48.000	36.000	31.000	44.000	32.000
TSS,MG/L	28.000	48.000	44.000	23.000	24.000	11.000	17.000	25.000	13.000	22.000	10.000	7.000	9.000	5.000
VSS,MG/L	23.000	--	4.000	23.000	24.000	11.000	16.000	24.000	11.000	21.000	10.000	7.000	9.000	5.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.940	7.000	6.800	7.100	6.780	--	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	91.216	90.588	89.970	91.667	90.281	89.443	91.096	88.571	92.105	88.000	94.079	94.000	95.862	96.528
COD REMOVED,%	76.491	80.332	75.127	74.921	81.440	68.456	77.500	79.167	80.381	73.841	83.217	88.037	84.046	89.552
TSS REMOVED,%	79.412	78.182	80.357	84.667	81.250	93.038	85.833	85.119	87.963	82.813	91.803	94.444	91.000	95.283
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.487	0.429	0.532	0.851	0.606	0.515	0.446	0.511	0.506	0.416	0.524	0.438	0.404	0.387
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	105.269	118.837	115.734	147.049	143.086	121.163	108.644	111.215	114.480	95.514	108.408	108.528	100.240	98.064
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	7205.500	7214.000	7027.000	7287.000	7213.500	7084.000	6539.500	6415.000	5709.000	6356.000	6759.000	6226.000	4998.000	6226.000
O2 SUPPLIED/BOD REMOVED,LB/LB	1.164	1.040	1.043	0.839	0.863	1.011	1.022	1.007	0.837	1.169	1.025	0.944	0.804	1.021
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4783.992	5855.996	4693.996	4380.996	4785.996	4813.996	4578.996	4633.996	4847.992	4953.996	4468.996	5368.992	5329.992	5369.996
VSS,MG/L	3462.999	4440.992	3484.999	2768.999	3785.999	3773.999	3901.000	3686.000	3627.999	3676.000	3313.000	3975.000	3980.000	4058.999
SVI,ML/GTSS	50.400	49.700	51.300	47.800	47.800	59.000	--	51.000	49.000	45.600	46.800	49.100	47.900	51.300
ZSV,FT/HR	7.500	4.500	5.040	5.700	5.940	6.040	6.250	6.020	5.780	6.000	6.980	6.740	5.830	5.550
TEMPERATURE,C **	16.000	16.030	17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000	16.000
DETENTION TIME,HR	2.105	2.142	2.128	1.833	2.046	2.107	2.012	1.885	1.988	1.960	2.099	2.070	2.166	2.199
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	508.819	500.762	503.288	584.474	523.567	508.358	532.324	568.273	538.776	546.611	510.282	517.576	494.531	487.157
SOLIDS LOAD,LB/FT2/DAY	22.275	26.903	21.816	23.101	22.817	21.770	24.118	23.642	23.905	24.498	20.592	25.454	24.219	23.997
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	--	--	806.697	1169.131	935.300	935.307	771.631	1315.275	75.859	771.624	1169.134	1063.913	876.842	1063.905
RETURN SLUDGE														
RECYCLE TSS,MG/L	28138.000	31238.000	27638.000	27250.000	25150.000	22536.000	24763.000	26175.000	24525.000	25913.000	28213.000	29425.000	28538.000	26663.000
RECYCLE RATIO,(%Q)	14.293	14.747	15.339	12.697	13.732	11.106	13.654	12.133	14.311	12.903	12.800	14.408	14.762	14.570

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	5/27/72	5/28/72	5/29/72	5/30/72	5/31/72	6/ 1/72	6/ 2/72	6/ 3/72	6/ 4/72	6/ 5/72	6/ 6/72	6/ 7/72	6/ 8/72	6/ 9/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.400	10.033	10.320	11.030	10.710	10.470	10.190	11.690	10.340	10.863	10.020	9.730	10.570	10.520
BOD5,MG/L	172.000	150.000	175.000	197.000	190.000	184.000	206.000	142.000	147.000	196.000	193.000	220.000	195.000	185.000
BOD5,SOL,MG/L	49.000	28.333	52.000	45.000	50.000	50.000	52.000	55.000	47.000	58.000	51.000	50.000	53.000	44.000
COD,MG/L	329.000	315.000	343.000	278.000	462.000	337.000	403.000	326.000	403.000	377.000	407.000	363.000	427.000	494.000
COD,SOL,MG/L	78.000	79.000	109.000	108.000	92.000	31.000	104.000	74.000	113.000	107.000	106.000	86.000	85.000	96.000
TSS,MG/L	112.000	148.000	184.000	171.000	128.000	178.000	162.000	143.000	163.000	208.000	152.000	166.000	158.000	138.000
VSS,MG/L	112.000	146.000	147.000	155.000	128.000	159.000	150.000	122.000	136.000	176.000	138.000	164.000	112.000	138.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.200	7.100	7.200	7.200	7.100	7.000	7.000	7.100	7.000	7.000	7.100	7.200	7.200
EFFLUENT														
BOD5,MG/L	9.000	9.000	9.000	9.000	9.000	14.000	12.000	13.900	10.000	12.000	11.000	19.000	10.000	10.000
BOD5,SOL,MG/L	6.000	5.000	6.000	6.000	5.000	6.000	8.000	11.000	8.000	7.000	7.000	8.000	5.000	5.000
COD,MG/L	47.000	63.000	47.000	43.000	42.000	46.000	56.000	56.000	55.000	45.000	62.000	43.000	64.000	56.000
COD,SOL,MG/L	20.000	24.000	31.000	7.000	46.000	19.000	30.000	41.000	50.000	36.000	44.000	35.000	38.000	52.000
TSS,MG/L	9.000	14.000	11.000	9.000	10.000	23.000	14.000	32.000	10.000	18.000	11.000	23.000	10.000	4.000
VSS,MG/L	9.000	14.000	8.000	9.000	10.000	15.000	14.000	28.000	10.000	14.000	11.000	23.000	7.000	4.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.900	7.000	7.000	7.000	6.900	6.900	7.000	7.100	7.000	7.000	6.900	6.800	6.900	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	94.767	94.000	94.857	95.431	95.263	92.391	94.175	90.211	94.792	93.878	94.301	91.364	94.872	94.595
COD REMOVED,%	85.714	80.000	86.297	84.532	83.969	86.350	86.104	82.822	86.352	88.064	84.767	88.154	85.012	88.664
TSS REMOVED,%	91.964	90.541	94.022	94.737	92.188	87.079	91.358	77.143	93.750	91.346	92.763	86.145	93.671	97.101
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.440	0.354	0.463	0.590	0.585	0.493	0.521	0.434	0.537	0.562	0.485	0.581	0.549	0.554
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	115.248	96.931	116.356	139.995	131.104	124.118	135.242	100.544	128.525	137.138	124.594	137.913	132.795	125.389
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	6705.000	5498.000	5748.000	5748.000	6397.000	7156.250	7633.598	6202.297	8110.699	6679.398	8492.398	7156.500	8587.797	7633.598
O2 SUPPLIED/BOD REMOVED,LB/LB	0.940	0.933	0.805	0.665	0.789	0.962	0.924	1.054	1.026	0.797	1.110	0.872	1.047	0.992
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5533.996	5538.992	5277.996	5070.992	4750.996	5317.199	5484.445	4869.277	5086.133	5170.172	5427.223	5080.855	5010.844	4783.164
VSS,MG/L	4195.996	4342.996	4029.000	3799.999	3590.000	4033.463	4157.809	3711.289	3838.239	3914.272	4119.473	3807.675	3873.656	3627.770
SVI,ML/GTSS	--	64.400	53.000	50.000	55.900	53.850	50.300	53.650	53.350	53.800	50.750	53.150	51.050	49.600
ZSV,FT/HR	--	6.630	5.270	7.640	7.650	5.460	6.190	6.625	4.395	5.810	5.865	4.200	5.915	7.345
TEMPERATURE,C **	17.000	17.333	17.003	17.000	18.000	18.000	18.000	18.000	18.000	19.000	19.000	19.000	19.000	18.000
DETENTION TIME,HR	2.235	2.317	2.252	2.107	2.170	2.220	2.281	2.115	2.237	2.140	2.319	2.389	2.199	2.209
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	479.322	462.269	475.635	508.358	493.610	482.548	469.643	530.514	478.861	500.523	461.838	448.443	487.157	484.853
SOLIDS LOAD,LB/FT2/DAY	24.497	23.920	23.184	23.274	21.090	23.152	23.423	22.659	22.113	23.518	22.784	21.411	22.118	20.432
SLUDGE WASTED														
*** SOLIDS WASTED,LB/HR	1122.365	--	1169.125	1157.438	913.793	701.478	900.228	736.551	--	1227.590	982.069	818.387	1026.834	1052.222
RETURN SLUDGE														
RECYCLE TSS,MG/L	21113.000	23413.333	23925.000	24034.000	25000.000	25237.500	25300.000	25137.500	22162.500	24700.000	26637.500	22087.500	20000.000	26062.500
RECYCLE RATE,(Q)R	15.366	16.680	15.364	12.759	12.325	12.703	13.582	15.760	13.397	13.508	13.962	17.369	13.169	10.038

** MEASD OR CAL WASTEWATER FLOW ONLY

*** WASTING RATE IS L MIXED PRIMARY AND SECONDARY SLUDGES(EXCLUDING AERATION SOLIDS)

APPENDIX A

DATE	6/10/72	6/11/72	6/12/72	6/13/72	6/14/72	6/15/72	6/16/72	6/17/72	6/18/72	6/19/72	6/20/72	6/21/72	6/22/72	6/23/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.600	10.740	10.710	10.820	10.820	10.840	10.580	10.680	13.400	11.310	10.060	11.460	12.480	10.850
BOD5,MG/L	193.000	183.000	--	--	--	--	--	--	--	157.000	155.000	164.000	65.000	63.000
BOD5,SOL,MG/L	45.000	49.000	--	--	--	--	--	--	--	41.000	47.000	21.000	18.000	20.000
COD,MG/L	506.000	329.000	--	--	--	--	--	--	--	409.000	315.000	376.000	158.000	110.000
COD,SOL,MG/L	158.000	94.000	--	--	--	--	--	--	--	126.000	110.000	110.000	95.000	47.000
TSS,MG/L	166.000	176.000	--	--	--	--	--	--	--	159.000	120.000	196.000	226.000	88.000
VSS,MG/L	154.000	152.000	--	--	--	--	--	--	--	125.000	105.000	156.000	36.000	60.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.300	7.200	7.300	7.200	7.300	7.100	7.000	7.000	7.000	7.100	7.100	7.100	7.000	6.800
EFFLUENT														
BOD5,MG/L	9.000	9.000	--	--	--	--	--	--	--	11.000	14.000	9.000	12.000	8.000
BOD5,SOL,MG/L	3.000	3.000	--	--	--	--	--	--	--	5.000	6.000	4.000	4.000	2.000
COD,MG/L	67.000	47.000	--	--	--	--	--	--	--	67.000	59.000	63.000	40.000	39.000
COD,SOL,MG/L	47.000	39.000	--	--	--	--	--	--	--	51.000	24.000	35.000	24.000	12.000
TSS,MG/L	9.000	17.000	--	--	--	--	--	--	--	9.000	13.000	21.000	21.000	22.000
VSS,MG/L	9.000	15.000	--	--	--	--	--	--	--	9.000	11.000	21.000	11.000	10.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.900	6.900	7.000	6.900	7.000	7.000	6.900	6.900	7.000	6.900	7.100	6.900	6.800	6.700
TOTAL REMOVALS														
BOD5 REMOVED,%	95.337	95.099	--	--	--	--	--	--	--	92.994	90.968	94.512	81.538	87.302
COD REMOVED,%	86.759	85.714	--	--	--	--	--	--	--	83.619	81.270	83.245	74.684	64.545
TSS REMOVED,%	94.578	90.341	--	--	--	--	--	--	--	94.340	89.167	89.286	90.708	75.000
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.532	0.476	--	--	--	--	--	--	--	0.467	0.477	0.507	0.318	0.236
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	134.293	119.912	--	--	--	--	--	--	--	114.402	100.462	121.299	52.264	44.039
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	7633.598	6582.977	7156.500	4961.797	7633.598	10496.199	1431.300	7156.500	8110.699	--	5725.199	5725.199	7633.598	7633.598
O2 SUPPLIED/BOD REMOVED,LB/LB	0.919	0.891	14288.215	9872.500	15240.754	20956.047	2838.146	14239.313	16137.893	--	0.959	0.764	2.751	3.049
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5256.465	5257.039	--	--	--	--	--	--	--	5157.258	4446.355	5020.254	3760.436	4538.141
VSS,MG/L	4042.154	4141.348	--	--	--	--	--	--	--	3927.607	3375.515	3835.170	2631.477	2991.867
SVI,ML/GTSS	53.000	51.930	--	--	--	--	--	--	--	54.600	54.200	56.000	45.750	44.500
ZSV,FT/HR	5.660	5.880	--	--	--	--	--	--	--	--	8.295	5.780	9.700	8.585
TEMPERATURE,C **	18.000	18.000	18.000	19.000	18.000	18.000	20.000	19.000	19.000	20.000	20.000	20.000	19.000	19.000
DETENTION TIME,HR	2.152	2.248	2.179	2.148	2.148	2.144	2.197	2.176	2.235	2.055	2.310	2.024	1.862	2.142
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	467.758	476.557	463.613	498.679	498.679	499.601	487.618	492.227	479.322	521.263	463.652	529.098	575.187	500.062
SOLIDS LOAD,LB/FT2/DAY	23.313	22.572	--	--	--	--	--	--	--	24.302	18.753	23.969	19.177	20.765
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	1104.827	--	935.307	631.333	701.482	771.623	941.144	859.306	--	982.062	736.551	555.331	--	455.056
RETURN SLUDGE														
RECYCLE TSS,MG/L	21737.500	22437.500	--	--	--	--	--	--	--	20365.000	21125.000	21012.500	23712.500	24050.000
RECYCLE RATIO,(RQ)	11.267	12.534	12.475	11.710	10.980	10.775	15.028	13.577	12.885	12.909	13.618	12.709	10.737	14.286

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	6/24/72	6/25/72	6/26/72	6/27/72	6/28/72	6/29/72	6/30/72	7/ 1/72	7/ 2/72	7/ 3/72	7/ 4/72	7/ 5/72	7/ 6/72	7/ 7/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	8.860	6.310	4.670	4.330	4.560	4.760	3.870	4.850	4.320	4.180	4.800	6.060	6.020	6.400
BOD5,MG/L	125.000	116.000	152.000	167.000	169.000	126.000	133.000	118.000	123.000	166.000	188.000	119.000	158.000	173.000
BOD5,SOL,MG/L	36.000	32.000	49.000	44.000	46.000	48.000	48.000	31.000	25.000	93.000	43.000	27.000	32.000	36.000
COD,MG/L	189.000	191.000	317.000	286.000	283.000	220.000	267.000	236.000	283.000	329.000	345.000	209.000	281.000	423.000
COD,SOL,MG/L	79.000	48.000	95.000	111.000	110.000	78.000	110.000	157.000	79.000	78.000	110.000	77.000	96.000	110.000
TSS,MG/L	112.000	93.000	141.000	130.000	123.000	116.000	93.000	110.000	130.000	110.000	162.000	116.000	132.000	148.000
VSS,MG/L	99.000	72.000	104.000	88.000	114.000	86.000	82.000	89.000	119.000	98.000	124.000	92.000	104.000	100.000
NH3-N,MG/L	—	—	—	—	—	—	—	—	—	—	19.400	23.100	20.400	—
NO3-N,MG/L	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PH	6.900	6.900	5.900	6.800	7.000	7.100	7.000	7.100	7.000	7.100	7.000	7.100	7.100	7.000
EFFLUENT														
BOD5,MG/L	14.000	10.000	12.000	13.000	11.000	10.000	11.000	10.000	11.000	8.000	9.000	13.000	7.000	8.000
BOD5,SOL,MG/L	6.000	5.000	7.000	6.000	6.000	4.000	4.000	5.000	3.000	4.000	5.000	5.000	4.000	3.000
COD,MG/L	42.000	40.000	48.000	56.000	43.000	47.000	47.000	43.000	55.000	59.000	47.000	62.000	35.000	51.000
COD,SOL,MG/L	16.000	16.000	28.000	40.000	24.000	27.000	39.000	31.000	35.000	43.000	31.000	35.000	31.000	20.000
TSS,MG/L	21.000	12.000	11.000	11.000	15.000	14.000	11.000	11.000	28.000	5.000	6.000	12.000	9.000	8.000
VSS,MG/L	19.000	10.000	8.000	11.000	15.000	13.000	10.000	11.000	24.000	5.000	6.000	10.000	9.000	—
NH3-N,MG/L	—	—	—	—	—	—	—	—	—	—	16.900	21.700	16.100	—
NO3-N,MG/L	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PH	6.800	6.700	6.700	7.000	6.800	6.900	6.900	6.800	6.900	6.900	6.900	6.900	6.900	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	88.800	91.379	92.105	92.216	93.491	92.063	91.729	90.980	90.833	95.000	95.213	89.076	95.570	95.376
COD REMOVED,%	77.778	79.058	84.858	80.420	84.806	78.636	82.397	81.780	80.565	82.067	86.377	79.935	87.544	87.943
TSS REMOVED,%	81.250	87.097	92.199	89.000	87.805	88.235	87.778	90.000	78.462	95.455	96.296	89.655	93.182	94.595
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.303	0.161	0.161	0.143	0.240	0.189	0.195	0.248	0.266	0.326	0.474	0.198	0.254	0.293
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	71.353	47.158	45.733	46.588	49.650	38.641	33.161	35.081	33.399	43.089	58.139	46.461	61.281	71.334
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	7156.500	6679.398	4771.000	10019.098	3816.799	5248.098	4771.000	2767.000	3912.000	3148.799	5247.898	3057.000	3816.699	3816.699
O2 SUPPLIED/BOD REMOVED,LB/LB	1.734	2.380	1.733	3.569	1.258	2.258	2.400	1.328	1.967	1.173	1.446	1.876	0.997	0.856
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5746.215	7062.773	7066.668	8078.730	4595.855	5021.973	4251.875	3465.391	3104.465	3179.185	3000.591	3644.438	5842.488	5830.480
VSS,MG/L	3778.868	4689.453	4566.156	5225.965	3317.133	3279.272	2724.379	2269.918	2012.978	2126.826	1967.531	3754.644	3864.933	3905.336
SVI,ML/GTSS	46.000	49.950	71.950	90.150	51.100	50.950	51.750	56.700	82.200	81.200	93.200	58.500	67.000	64.700
ZSV,FT/HR	5.415	5.810	1.400	0.465	6.365	7.530	8.835	4.680	1.300	1.080	0.650	5.200	4.400	4.120
TEMPERATURE,C **	19.000	19.000	20.000	20.000	20.000	20.000	20.000	20.000	21.000	21.000	21.000	19.000	20.000	21.000
DETENTION TIME,HR	2.623	3.683	4.977	5.267	5.097	4.883	6.005	4.695	5.380	5.560	4.842	3.835	3.861	3.631
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	408.345	290.819	215.234	199.564	210.164	219.382	178.363	228.139	199.153	192.651	221.226	279.297	277.454	294.968
SOLIDS LOAD,LB/FT2/DAY	21.859	21.152	16.673	17.899	11.465	11.895	8.675	6.330	4.949	4.904	5.315	24.848	15.311	15.858
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	466.726	--	1102.631	583.425	641.740	495.891	122.518	198.280	--	700.122	350.030	--	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	26512.500	21937.500	20400.000	18825.000	21000.000	18912.500	19437.500	22200.000	23850.000	19850.000	21538.000	17863.000	17788.000	20738.000
RECYCLE RATIO,(R)	16.354	28.621	36.516	38.314	36.382	34.853	42.868	0.000	0.000	0.000	0.000	96.869	17.973	15.172

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	7/ 8/72	7/ 9/72	7/10/72	7/11/72	7/12/72	7/13/72	7/14/72	7/15/72	7/16/72	7/17/72	7/18/72	7/19/72	7/20/72	7/21/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	6.560	6.260	6.560	6.260	8.990	10.350	8.450	7.430	6.900	8.180	9.370	7.830	3.720	3.750
BOD5,MG/L	154.000	137.000	140.000	160.000	182.000	141.000	140.000	201.000	163.000	192.000	184.000	185.000	190.000	215.000
BOD5,SOL,MG/L	37.000	36.000	38.000	35.000	63.000	25.000	36.000	42.000	48.000	62.000	58.000	64.000	63.000	78.000
COD,MG/L	312.000	312.000	308.000	348.000	399.000	281.000	279.000	427.000	313.000	251.000	569.000	408.000	413.000	349.000
COD,SOL,MG/L	63.000	109.000	77.000	95.000	80.000	94.000	78.000	95.000	110.000	95.000	79.000	125.000	111.000	64.000
TSS,MG/L	130.000	144.000	114.000	232.000	122.000	98.000	94.000	138.000	129.000	132.000	132.000	116.000	134.000	164.000
VSS,MG/L	108.000	112.000	102.000	162.000	108.000	98.000	94.000	114.000	108.000	112.000	112.000	94.000	110.000	150.000
NH3-N,MG/L	--	--	5.500	--	--	3.700	--	--	6.800	5.400	6.800	10.400	5.100	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	0.300	--
PH	7.200	7.000	7.100	7.100	7.000	7.000	6.900	6.900	6.900	6.900	6.900	6.800	6.800	6.700
EFFLUENT														
BOD5,MG/L	7.000	8.000	8.000	7.000	9.000	10.000	8.000	7.000	8.000	11.000	7.000	8.000	8.000	7.000
BOD5,SOL,MG/L	4.000	5.000	4.000	5.000	6.000	5.000	6.000	6.000	6.000	10.000	4.000	5.000	5.000	7.000
COD,MG/L	39.000	55.000	50.000	44.000	64.000	43.000	39.000	55.000	43.000	39.000	47.000	51.000	56.000	36.000
COD,SOL,MG/L	31.000	47.000	39.000	44.000	48.000	39.000	27.000	36.000	27.000	16.000	24.000	8.000	24.000	24.000
TSS,MG/L	4.000	10.000	7.000	30.000	4.000	8.000	7.000	11.000	6.000	8.000	8.000	9.000	10.000	17.000
VSS,MG/L	4.000	10.000	7.000	13.000	4.000	8.000	7.000	11.000	6.000	7.000	7.000	8.000	8.000	15.000
NH3-N,MG/L	--	--	8.300	--	--	4.700	--	--	10.100	5.700	5.300	4.300	6.600	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	6.000	--	--	--	0.100	--
PH	7.000	6.800	6.800	6.900	7.100	7.000	7.000	6.900	6.600	6.800	6.900	7.900	6.800	6.700
TOTAL REMOVALS														
BOD5 REMOVED,%	95.455	94.161	94.286	95.625	95.055	92.908	94.286	96.517	95.092	94.271	96.196	95.676	95.789	96.744
COD REMOVED,%	87.500	82.372	83.766	87.356	83.960	84.697	86.021	87.119	86.262	84.462	91.740	87.500	86.441	89.685
TSS REMOVED,%	96.923	93.056	93.860	87.069	96.721	91.837	92.553	92.024	95.030	93.939	93.939	92.241	92.537	89.634
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.255	0.216	0.232	0.244	0.388	0.547	0.342	0.414	0.279	0.488	0.499	0.424	0.134	0.168
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	65.087	55.294	59.170	64.531	105.415	94.022	76.218	96.218	72.462	101.187	111.078	93.326	49.537	51.945
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4293.797	--	--	4293.598	3816.659	2862.500	1908.300	3425.799	4293.797	3816.699	6202.098	>>34.199	4770.797	3339.600
O2 SUPPLIED/BOD REMOVED,LB/LB	1.058	--	--	1.061	0.577	0.496	0.404	0.593	0.947	0.605	0.878	0.937	1.657	0.998
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5893.551	6163.125	6119.281	6318.563	6376.859	4121.824	5077.078	5440.715	6076.430	4846.969	5239.688	5089.172	7950.016	7176.477
VSS,MG/L	4093.290	4106.285	4088.056	4237.301	4349.945	2754.339	3574.375	3724.155	4157.813	3324.223	3567.209	3524.807	5458.289	4949.117
SVI,ML/GTSS	60.500	80.100	76.700	80.950	99.400	57.150	65.300	65.350	79.900	60.950	61.750	59.250	99.800	90.550
ZSV,FT/HR	3.750	1.160	2.160	1.650	0.080	10.760	13.810	3.710	2.460	6.940	5.770	6.340	0.330	1.100
TEMPERATURE,C **	20.000	21.000	21.000	21.000	23.000	23.000	22.000	22.000	22.900	23.900	23.600	23.600	23.000	25.600
DETENTION TIME,HR	3.543	3.713	3.543	3.713	2.585	2.246	2.750	3.124	3.368	2.841	2.480	2.968	6.248	6.198
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	302.342	288.515	302.342	288.515	414.337	477.018	389.449	342.439	318.312	377.005	431.851	360.874	171.450	172.833
SOLIDS LOAD,LB/FT2/DAY	16.502	16.502	17.071	16.927	23.507	17.263	18.446	17.926	19.079	17.376	20.464	16.854	14.219	12.023
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	--	--	420.050	437.552	612.573	367.543	406.299	385.045	--	700.083	805.095	612.572	466.721	536.731
RETURN SLUDGE														
RECYCLE TSS,MG/L	21875.000	23288.000	19125.000	21788.000	22050.000	21738.000	21235.000	21884.000	21593.000	19863.000	19163.000	20838.000	17088.000	19113.000
RECYCLE RATIO,(%)	15.671	15.911	15.244	15.974	11.123	9.662	16.521	23.173	23.319	18.765	12.956	14.623	30.296	21.067

** BASED ON R&D WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	7/22/72	7/23/72	7/24/72	7/25/72	7/26/72	7/27/72	7/28/72	7/29/72	7/30/72	7/31/72	8/ 1/72	8/ 2/72	8/ 3/72	8/ 4/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	3.650	3.420	3.690	3.290	5.570	8.500	8.890	9.260	8.770	9.450	9.780	9.740	9.790	9.950
BOD5,MG/L	201.000	195.000	161.000	259.000	168.000	144.000	184.000	204.000	145.000	144.000	204.000	164.000	200.000	177.000
BOD5,SOL,MG/L	54.000	23.000	42.000	53.000	38.000	13.000	34.000	30.000	34.333	46.000	32.000	37.000	44.000	57.000
COD,MG/L	411.000	373.000	327.000	464.000	432.000	466.000	422.000	481.000	371.000	366.000	490.000	425.000	394.000	411.000
COD,SOL,MG/L	127.000	78.000	109.000	112.000	144.000	31.000	63.000	93.000	124.000	179.000	307.000	106.000	77.000	107.000
TSS,MG/L	130.000	156.000	142.000	144.000	154.000	220.000	170.000	200.000	154.333	148.000	188.000	174.000	167.000	202.000
VSS,MG/L	128.000	128.000	122.000	140.000	136.000	208.000	152.000	148.000	144.000	136.000	128.000	150.000	129.000	144.000
NH3-N,MG/L	--	5.700	6.200	6.800	--	19.600	--	--	22.500	--	25.100	--	--	--
NO3-N,MG/L	--	0.250	0.300	0.300	0.300	0.020	--	--	0.050	--	0.230	--	--	--
PH	6.800	6.900	7.000	6.800	7.000	6.900	6.900	6.900	7.000	6.900	6.900	6.800	6.900	6.800
EFFLUENT														
BOD5,MG/L	9.000	10.000	9.000	10.000	9.000	11.000	10.000	7.000	10.000	18.000	12.000	18.000	11.000	12.000
BOD5,SOL,MG/L	7.000	7.000	3.000	5.000	3.000	3.000	5.000	4.000	3.000	5.000	5.000	5.000	3.000	5.000
COD,MG/L	47.000	47.000	47.000	40.000	56.000	31.000	51.000	62.000	54.000	81.000	88.000	95.000	42.000	61.000
COD,SOL,MG/L	28.000	27.000	31.000	36.000	48.000	12.000	27.000	31.000	31.000	43.000	65.000	34.000	42.000	42.000
TSS,MG/L	14.000	12.000	11.000	10.000	13.000	29.000	11.000	10.000	25.000	31.000	17.000	33.000	21.000	29.000
VSS,MG/L	12.000	10.000	11.000	7.000	12.000	14.000	11.000	10.000	23.000	24.000	13.000	29.000	15.000	19.000
NH3-N,MG/L	--	8.000	8.000	7.300	--	23.100	--	--	20.500	--	23.100	--	--	--
NO3-N,MG/L	--	0.100	0.150	0.100	0.150	--	--	--	--	--	0.200	--	--	--
PH	6.600	6.700	7.000	6.700	7.000	6.900	6.900	6.900	6.700	6.800	6.800	6.600	6.600	6.700
TOTAL REMOVALS														
BOD5 REMOVED,%	95.522	94.872	94.410	96.139	94.643	92.361	94.565	96.569	93.103	90.722	94.118	89.024	94.500	93.220
COD REMOVED,%	88.564	87.399	85.627	91.379	87.037	93.348	87.915	87.110	85.445	79.016	82.041	77.647	88.136	85.158
TSS REMOVED,%	89.231	92.308	92.254	93.056	91.558	86.818	93.529	95.000	83.766	79.054	90.957	81.034	87.425	85.644
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.144	0.128	0.253	0.166	0.226	0.370	0.476	0.548	0.341	0.521	0.541	0.451	0.595	0.721
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	47.267	42.967	38.278	54.899	60.289	78.859	105.388	121.706	81.929	119.365	128.541	102.914	126.149	113.466
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	7633.297	3816.699	4293.797	--	5725.000	4580.000	4580.000	8969.199	4961.699	7347.098	4771.000	7033.598	5248.098	6870.238
O2 SUPPLIED/BOD REMOVED,LB/LB	2.540	1.404	1.776	--	1.521	0.956	0.699	1.164	0.991	1.033	0.599	1.266	0.667	0.98
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	7548.109	7860.316	3486.287	6954.391	6081.207	5012.945	5144.520	5110.156	5502.621	5217.363	5351.668	5155.441	4798.250	3460.015
VSS,MG/L	5257.016	5366.737	2625.973	5296.883	4282.004	3414.177	3548.784	3560.433	3846.118	3669.968	3810.714	3655.682	3398.553	2522.801
SVI,ML/GTSS	94.150	93.700	107.800	104.500	109.100	69.450	74.400	90.900	90.600	109.495	103.635	87.110	85.450	17.250
ISV,FT/HR	0.930	0.910	0.288	0.360	0.330	4.750	3.480	2.200	2.270	1.130	1.150	2.070	2.430	2.640
TEMPERATURE,C **	25.500	26.000	26.600	24.000	22.800	22.100	22.000	21.000	21.400	21.600	22.000	22.000	23.000	22.000
DETENTION TIME,HR	6.367	6.796	6.298	7.064	4.173	2.734	2.614	2.510	2.650	2.434	2.376	2.386	2.374	2.336
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	168.224	157.623	170.067	151.632	256.714	391.754	409.728	426.781	404.198	440.147	450.767	448.904	451.208	458.582
SOLIDS LOAD,LB/FT2/DAY	12.612	12.716	5.977	10.886	15.275	18.361	19.762	20.539	21.229	21.453	22.363	20.998	19.485	14.238
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	536.729	--	612.573	805.095	805.092	805.095	122.514	980.116	--	670.913	804.261	641.742	770.091	758.423
RETURN SLUDGE														
RECYCLE TSS,MG/L	17939.000	17788.000	17813.000	16575.000	16313.000	20038.000	19475.000	16675.000	17813.000	19727.500	20487.500	16475.000	17425.000	17637.500
RECYCLE RATIO,(EQ)	26.027	28.187	25.908	24.936	22.208	16.776	17.098	17.624	19.213	16.681	15.787	13.326	12.411	12.080

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	8/ 5/72	8/ 6/72	8/ 7/72	8/ 8/72	8/ 9/72	8/10/72	8/11/72	8/12/72	8/13/72	8/14/72	8/15/72	8/16/72	8/17/72	8/18/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.310	9.050	9.750	9.820	9.250	9.430	8.450	8.220	7.760	8.400	8.990	9.540	9.880	10.490
BOD5,MG/L	142.000	173.000	200.000	220.000	210.000	246.000	220.000	198.000	208.000	186.000	178.000	206.000	216.000	154.000
BOD5,SOL,MG/L	32.000	45.000	46.000	53.000	65.000	63.000	50.000	59.000	51.000	44.000	34.000	35.000	67.000	35.000
COD,MG/L	358.000	353.000	451.000	487.000	411.000	547.000	422.000	377.000	342.000	453.000	372.000	494.000	487.000	292.000
COD,SOL,MG/L	62.000	77.000	78.000	167.000	91.000	243.000	106.000	121.000	134.000	63.000	109.000	140.000	304.000	61.000
TSS,MG/L	242.000	183.000	226.000	228.000	238.000	280.000	172.000	234.000	174.000	184.000	160.000	180.000	162.000	106.000
VSS,MG/L	108.000	151.000	118.000	156.000	148.000	144.000	154.000	212.000	162.000	158.000	134.000	166.000	146.000	102.000
NH3-N,MG/L	--	--	--	--	8.250	22.000	--	--	--	--	13.500	--	--	--
NO3-N,MG/L	--	--	--	--	0.220	0.220	--	--	--	--	0.220	--	--	--
PH	6.800	6.900	6.900	6.900	6.900	7.100	6.800	6.900	6.800	7.100	7.200	7.300	7.100	7.100
EFFLUENT														
BOD5,MG/L	10.000	8.000	9.000	16.000	16.000	15.000	13.000	10.000	7.000	7.000	8.000	9.000	16.000	17.000
BOD5,SOL,MG/L	4.000	5.000	6.000	6.000	7.000	7.000	6.000	5.000	5.000	5.000	2.000	3.000	11.000	8.000
COD,MG/L	55.000	31.000	47.000	65.000	65.000	68.000	49.000	42.000	37.000	39.000	47.000	70.000	84.000	81.000
COD,SOL,MG/L	35.000	18.000	35.000	49.000	27.000	57.000	34.000	38.000	30.000	31.000	47.000	15.000	53.000	42.000
TSS,MG/L	30.000	14.000	20.000	44.000	42.000	41.000	9.000	28.000	7.000	16.000	13.000	14.000	17.000	23.000
VSS,MG/L	10.000	6.700	4.000	29.000	18.000	14.000	8.000	20.000	7.000	13.000	11.000	14.000	14.000	21.000
NH3-N,MG/L	--	--	--	--	13.200	12.650	--	--	--	--	14.300	--	--	--
NO3-N,MG/L	--	--	--	--	0.180	0.180	--	--	--	--	--	--	--	--
PH	6.700	6.700	6.700	6.850	6.800	6.850	6.700	6.600	6.700	7.100	7.100	7.000	7.200	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	92.956	95.376	95.500	92.727	92.381	93.902	94.091	94.949	96.635	96.237	95.506	95.631	91.204	88.961
COD REMOVED,%	84.637	91.218	89.579	86.653	84.185	87.569	88.389	88.859	89.181	91.391	87.366	85.830	82.752	72.260
TSS REMOVED,%	87.603	92.350	91.150	80.702	82.353	85.357	94.767	88.034	95.977	91.304	91.875	92.222	89.506	78.704
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.385	0.429	0.607	0.589	0.549	0.626	0.528	0.475	0.397	0.430	0.464	0.614	0.667	0.482
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	85.174	100.871	125.634	139.189	125.150	149.458	119.771	104.860	103.991	100.661	103.098	126.615	137.493	104.080
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5725.199	5725.199	5725.199	3816.799	7a33.598	11450.398	7633.598	6011.457	7633.598	5248.098	7156.500	6402.297	6679.398	6488.559
O2 SUPPLIED/BOD REMOVED,LB/LB	1.103	0.908	0.725	0.450	1.004	1.236	1.030	0.921	1.159	0.823	1.105	0.781	0.812	1.065
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4950.109	5350.688	4557.387	5022.000	5006.586	5247.926	5055.816	5024.906	5771.387	5216.477	5021.078	4066.766	4544.594	4663.516
VSS,MG/L	3543.162	3772.395	3317.848	3790.816	3o53.314	3826.626	3632.817	353o.685	4203.559	3755.882	3558.135	3304.799	3304.305	3457.969
SVI,ML/GTSS	87.300	97.750	97.000	95.250	89.700	77.750	86.400	75.500	68.200	73.050	73.400	78.000	752700	76.700
ZSV,FT/HR	2.570	1.760	2.690	1.950	2.200	2.940	2.470	3.620	3.010	3.870	4.080	4.770	5.100	4.980
TEMPERATURE,C **	21.000	21.000	22.000	22.000	22.000	23.000	22.000	21.000	21.000	22.000	22.000	21.000	21.000	22.000
DETENTION TIME,HR	2.496	2.568	2.384	2.367	2.513	2.465	2.750	2.827	2.995	2.767	2.585	2.436	2.352	2.216
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	429.085	417.102	449.365	452.591	426.323	434.616	389.449	378.849	357.648	387.145	414.337	439.686	455.356	483.470
SOLIDS LOAD,LB/FT2/DAY	19.307	20.311	18.415	20.433	19.265	20.409	18.096	17.363	19.107	18.482	18.880	18.466	18.586	20.630
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	350.037	--	833.432	734.250	983.402	1029.289	1101.310	1050.125	--	816.764	979.282	640.933	895.939	612.573
RETURN SLUDGE														
RECYCLE TSS,MG/L	17737.500	19503.333	19362.500	19975.000	18o76.000	21712.500	22012.500	16700.00	19412.500	17875.000	20056.000	19312.500	18600.000	19862.500
RECYCLE RATIO,(R/Q)	13.534	13.669	12.308	12.291	12.735	11.760	14.743	13.91.	15.619	14.262	13.348	12.400	12.176	14.280

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	8/19/72	8/20/72	8/21/72	8/22/72	8/23/72	8/24/72	8/25/72	8/26/72	8/27/72	8/28/72	8/29/72	8/30/72	8/31/72	9/ 1/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.030	8.870	9.570	9.410	9.330	9.350	9.610	8.720	8.700	9.260	8.210	8.940	9.030	9.060
BOD5,MG/L	217.000	229.000	206.000	237.000	260.000	206.000	244.000	194.000	230.000	142.000	204.000	175.000	127.000	212.000
BOD5,SOL,MG/L	44.000	44.000	47.000	42.000	63.000	55.000	60.000	34.000	36.000	36.000	42.000	52.000	--	--
COD,MG/L	365.000	421.000	373.000	355.000	436.000	321.000	430.000	411.000	455.000	327.000	392.000	371.000	210.000	353.000
COD,SOL,MG/L	46.000	60.000	90.000	65.000	91.000	48.000	64.000	63.000	78.000	82.000	114.000	129.000	--	--
TSS,MG/L	182.000	132.000	152.000	188.000	214.000	152.000	162.000	192.000	184.000	134.000	218.000	162.000	118.000	138.000
VSS,MG/L	150.000	123.000	146.000	174.000	200.000	118.000	148.000	160.000	164.000	110.000	186.000	128.000	90.000	118.000
NH3-N,MG/L	--	--	--	--	14.600	--	--	--	--	12.900	--	--	--	--
NO3-N,MG/L	--	--	--	--	0.300	--	--	--	--	0.190	--	--	--	--
PH	7.100	7.100	7.200	7.200	7.200	7.000	7.200	7.100	7.000	7.200	7.000	7.200	6.800	7.200
EFFLUENT														
BOD5,MG/L	8.000	7.000	10.000	9.000	16.000	11.000	12.000	10.000	8.000	7.000	7.000	7.000	147.000	10.000
BOD5,SOL,MG/L	4.000	3.000	5.000	5.000	8.000	6.000	6.000	4.000	5.000	5.000	3.000	3.000	--	--
COD,MG/L	19.000	30.000	49.000	65.000	65.000	40.000	52.000	51.000	47.000	57.000	49.000	36.000	255.000	56.000
COD,SOL,MG/L	15.000	26.000	4.000	28.000	20.000	28.000	44.000	43.000	31.000	33.000	33.000	28.000	--	--
TSS,MG/L	15.000	8.000	11.000	13.000	13.000	13.000	14.000	21.000	13.000	19.000	19.000	17.000	116.000	10.000
VSS,MG/L	10.000	8.000	11.000	11.000	12.000	7.000	14.000	19.000	13.000	15.800	14.000	11.000	95.000	9.000
NH3-N,MG/L	--	--	--	--	15.400	--	--	--	--	14.300	--	--	--	--
NO3-N,MG/L	--	--	--	--	0.030	--	--	--	--	0.080	--	--	--	--
PH	7.100	7.200	7.100	7.200	7.200	7.000	6.900	6.900	6.800	6.800	6.800	6.900	7.100	7.100
TOTAL REMOVALS														
BOD5 REMOVED,%	96.313	96.943	95.146	96.203	93.846	94.660	95.082	94.845	96.522	95.070	96.569	96.000	--	95.283
COD REMOVED,%	94.795	92.874	86.863	83.099	85.092	87.539	87.907	87.591	89.670	82.569	87.500	90.296	--	84.136
TSS REMOVED,%	91.758	93.939	92.763	93.085	93.925	91.447	91.358	89.063	92.935	85.821	91.284	89.506	1.695	92.754
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.529	0.501	0.582	0.653	0.662	0.544	0.645	0.469	0.552	0.378	0.484	0.485	0.367	0.668
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	140.227	130.867	127.014	143.684	156.288	124.094	151.072	108.991	128.919	84.900	107.906	100.797	73.886	123.747
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5582.066	4293.898	6536.270	5820.617	4770.000	5580.898	7013.367	5725.199	4771.000	4961.840	--	--	--	8110.398
O2 SUPPLIED/BOD REMOVED,LB/LB	0.628	0.513	0.819	0.640	0.493	0.720	0.748	0.839	0.581	0.931	--	--	--	1.046
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5892.059	5623.063	4722.305	4815.645	5024.199	4817.766	5011.227	4923.352	4969.138	4788.641	4778.203	4505.043	4259.352	5112.375
VSS,MG/L	4245.262	4188.125	3500.965	3524.334	3788.341	3653.238	3752.046	3727.123	3743.655	3599.680	3573.625	3329.585	3222.470	2971.222
SVI,ML/GTSS	76.650	107.300	85.100	80.750	85.600	75.350	81.900	81.500	78.350	79.550	72.350	79.000	76.500	71.150
ZSV,FT/HR	2.370	1.800	2.940	3.530	2.890	4.530	3.000	2.700	3.360	3.000	3.100	4.000	5.150	6.710
TEMPERATURE,C **	22.000	23.000	23.000	22.000	23.000	23.000	23.000	23.000	23.000	23.000	23.000	23.000	22.000	22.000
DETENTION TIME,HR	2.317	2.620	2.429	2.470	2.491	2.486	2.418	2.665	2.671	2.504	2.831	2.600	2.574	2.565
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	462.269	408.806	441.069	433.694	430.007	430.929	442.912	401.893	400.971	427.703	378.388	412.032	416.181	417.563
SOLIDS LOAD,LB/FT2/DAY	25.271	21.756	19.490	19.579	20.190	19.415	20.481	18.342	18.261	18.552	16.718	16.976	16.192	19.491
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	900.107	554.232	525.062	735.087	595.071	720.502	886.771	857.601	630.074	857.602	--	--	--	735.087
RETURN SLUDGE														
RECYCLE TSS,MG/L	20825.000	20300.000	16587.500	18712.500	18387.500	18625.000	19437.500	18875.000	18087.500	19650.000	19112.500	19025.000	16637.500	14950.000
RECYCLE RATIO,(RQ)	15.882	18.207	16.876	17.088	16.720	16.802	15.255	15.780	14.471	13.136	15.493	14.228	14.086	14.040

** BASED ON RAW WASTEWATER FLOW ONLY

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APPENDIX A

DATE	9/ 2/72	9/ 3/72	9/ 4/72	9/ 5/72	9/ 6/72	9/ 7/72	9/ 8/72	9/ 9/72	9/10/72	9/11/72	9/12/72	9/13/72	9/14/72	9/15/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	8.420	8.730	8.760	8.430	8.670	8.550	8.170	8.420	8.140	8.460	8.220	7.910	6.100	8.920
BOD5,MG/L	144.000	80.000	202.000	166.000	241.000	248.000	237.000	166.000	199.000	206.000	217.000	241.000	207.000	213.000
BOD5,SOL,MG/L	—	—	—	—	—	63.000	49.000	32.000	43.000	45.000	41.000	50.000	51.000	40.000
COD,MG/L	272.000	285.000	395.000	433.000	432.000	369.000	486.000	394.000	432.000	483.000	548.000	485.000	508.000	413.000
COD,SOL,MG/L	—	—	—	—	—	92.000	122.000	45.000	139.000	106.000	76.000	135.000	164.000	138.000
TSS,MG/L	138.000	108.000	212.000	150.000	210.000	188.000	187.000	162.000	190.000	228.000	236.000	214.000	182.000	170.000
VSS,MG/L	114.000	94.000	160.000	128.000	178.000	158.000	151.000	126.000	172.000	202.000	218.000	190.000	164.000	128.000
NH3-N,MG/L	—	—	—	12.650	—	—	—	—	—	—	18.900	—	—	—
NO3-N,MG/L	—	—	—	0.100	—	—	—	—	—	—	0.230	—	—	—
PH	7.200	7.600	7.100	7.200	7.200	7.200	7.100	7.100	7.000	7.100	7.100	7.100	7.300	7.100
EFFLUENT														
BOD5,MG/L	31.000	119.000	14.000	8.000	13.000	8.000	10.000	7.000	11.000	10.000	10.000	11.000	8.000	15.000
BOD5,SOL,MG/L	—	—	—	—	—	8.000	3.000	1.000	4.000	2.000	2.000	4.000	2.000	4.000
COD,MG/L	132.000	209.000	63.000	58.000	61.000	31.000	69.000	49.000	69.000	64.000	72.000	64.000	67.000	61.000
COD,SOL,MG/L	—	—	—	—	—	27.000	42.000	26.000	39.000	30.000	19.000	49.000	26.000	31.000
TSS,MG/L	70.000	116.000	32.000	14.000	21.000	14.000	16.000	13.000	14.000	28.000	36.000	24.000	21.000	26.000
VSS,MG/L	59.000	94.000	27.000	12.000	19.000	10.000	13.000	9.000	10.000	24.000	33.000	21.000	18.000	14.000
NH3-N,MG/L	—	—	—	7.430	—	—	—	—	—	—	15.300	—	—	—
NO3-N,MG/L	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PH	6.900	7.400	6.900	7.100	7.100	7.000	7.000	7.100	6.800	6.900	7.000	6.900	7.000	7.100
TOTAL REMOVALS														
BOD5 REMOVED,%	78.472	—	93.069	95.181	94.606	96.774	95.781	95.783	94.472	95.146	95.392	95.436	96.135	92.958
COD REMOVED,%	51.471	26.667	84.051	85.608	85.880	91.599	85.861	87.563	84.028	86.749	86.861	86.804	86.811	85.230
TSS REMOVED,%	49.275	—	84.906	90.667	90.000	92.553	91.444	91.975	92.632	87.719	84.746	88.785	88.462	84.706
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.359	0.206	0.523	0.422	0.620	0.587	0.540	0.375	0.437	0.467	0.497	0.589	0.382	0.588
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	78.117	44.996	114.006	90.159	134.619	136.612	124.750	90.052	104.364	112.680	114.922	122.819	81.353	122.410
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	6202.098	6202.098	6679.199	4293.797	6679.199	7156.297	7347.098	6679.199	5915.797	7156.297	6202.098	8587.500	5247.898	8110.398
O2 SUPPLIED/BOD REMOVED,LB/LB	1.538	—	0.967	0.766	0.803	0.826	0.941	1.185	0.925	1.025	0.866	1.114	1.020	1.095
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4627.328	4648.383	4527.684	4559.652	4590.656	4922.559	4847.129	5054.828	5089.117	5166.535	4912.637	4770.590	4526.195	4369.523
VSS,MG/L	3488.424	3499.274	3494.136	3421.934	3480.198	3730.096	3699.895	3851.086	3828.820	3869.388	3795.009	3341.964	3413.711	3338.056
SVI,ML/GTSS	81.100	80.530	84.600	75.450	79.150	66.100	75.200	88.900	99.950	84.000	88.800	80.500	77.050	78.150
ZSV,FT/HR	5.270	4.030	3.890	4.810	4.610	5.410	4.070	2.350	1.820	3.270	3.110	4.470	5.470	4.950
TEMPERATURE,C **	22.000	22.000	19.000	20.000	20.000	21.000	20.000	20.000	19.000	19.000	20.000	22.000	22.000	19.000
DETENTION TIME,HR	2.760	2.662	2.653	2.757	2.681	2.718	2.845	2.760	2.855	2.737	2.827	2.938	3.810	2.606
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	388.066	402.354	403.737	388.527	399.589	394.058	376.564	388.066	375.162	391.293	378.849	364.561	281.141	411.111
SOLIDS LOAD,LB/FT2/DAY	17.152	17.755	17.295	16.519	17.246	18.253	17.326	18.356	17.851	18.693	16.931	15.826	11.584	16.449
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	612.563	700.093	694.248	665.079	665.079	490.096	791.761	513.394	997.619	256.696	770.092	710.084	977.615	916.776
RETURN SLUDGE														
RECYCLE TSS,MG/L	15263.000	15838.000	15413.000	15738.000	16053.000	17975.000	16213.000	14525.000	15975.000	18875.000	18625.000	17603.000	19000.000	17350.000
RECYCLE RATIO,(R)	19.299	18.568	17.900	16.465	17.424	17.532	18.568	16.676	16.781	15.489	13.625	13.654	13.705	14.372

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	9/16/72	9/17/72	9/18/72	9/19/72	9/20/72	9/21/72	9/22/72	9/23/72	9/24/72	9/25/72	9/26/72	9/27/72	9/28/72	9/29/72
INFLUENT WASTEWATER														
FLOW RATE(A),MGD	9.020	9.060	9.080	8.860	8.680	8.980	8.080	8.700	8.770	9.250	8.600	8.780	8.780	9.870
BOD5,MG/L	193.000	210.000	196.000	211.000	250.000	227.000	156.000	170.000	196.000	210.000	186.000	214.000	204.000	212.000
BOD5,SOL,MG/L	47.000	47.000	48.000	41.000	50.000	58.000	28.000	35.000	46.000	42.000	40.000	43.000	41.000	51.000
COD,MG/L	437.000	443.000	446.000	520.000	531.000	570.000	438.000	443.000	412.000	427.000	455.000	551.000	409.000	478.000
COD,SOL,MG/L	91.000	89.000	84.000	142.000	156.000	188.000	188.000	79.000	84.000	99.000	118.000	142.000	94.000	112.000
TSS,MG/L	172.000	244.000	170.000	276.000	224.000	218.000	176.000	162.000	180.000	230.000	236.000	276.000	196.000	190.000
VSS,MG/L	132.000	162.000	126.000	220.000	146.000	158.000	128.000	132.000	138.000	174.000	174.000	137.000	174.000	186.000
NH3-N,MG/L	—	—	—	14.230	—	—	—	—	—	15.620	14.790	—	—	—
NO3-N,MG/L	—	—	—	0.400	—	—	—	—	—	0.240	0.230	—	—	—
PH	7.100	7.000	7.000	7.200	7.200	7.100	7.100	7.200	7.200	7.200	7.100	7.100	7.200	7.100
EFFLUENT														
BOD5,MG/L	9.000	8.000	9.000	11.000	12.000	13.000	9.000	10.000	11.000	11.000	11.000	14.000	10.000	9.000
BOD5,SOL,MG/L	4.000	3.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	4.000	2.000	5.000	2.000	2.000
COD,MG/L	64.000	66.000	52.000	75.000	90.000	112.000	43.000	75.000	69.000	61.000	71.000	47.000	47.000	56.000
COD,SOL,MG/L	26.000	30.000	30.000	35.000	43.000	59.000	35.000	36.000	34.000	38.000	27.000	31.000	31.000	32.000
TSS,MG/L	17.000	16.000	25.000	30.000	44.000	34.000	19.000	19.000	20.000	26.000	31.000	27.000	12.000	21.000
VSS,MG/L	12.000	7.000	16.000	16.000	22.000	18.000	11.000	16.000	8.000	17.000	20.000	19.000	11.000	15.000
NH3-N,MG/L	—	—	—	14.790	—	—	—	—	—	14.230	14.510	—	—	—
NO3-N,MG/L	—	—	—	0.100	—	—	—	—	—	—	0.050	—	—	—
PH	6.900	6.900	6.900	7.000	7.000	7.100	7.100	6.900	7.100	7.100	7.100	7.300	7.100	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	95.337	96.190	95.408	94.787	95.200	94.273	94.231	94.118	94.388	94.762	94.086	93.458	95.098	95.755
COD REMOVED,%	85.355	85.102	88.341	85.577	83.051	80.351	90.183	83.070	83.252	85.714	84.396	91.470	88.509	88.285
TSS REMOVED,%	90.116	93.443	85.294	89.130	80.357	84.404	89.205	88.272	88.889	87.826	86.864	86.831	93.878	88.947
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.548	0.535	0.570	0.577	0.774	0.661	0.408	0.478	0.548	0.765	0.629	0.691	0.606	0.648
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	112.159	122.560	114.660	120.445	139.808	131.333	81.210	95.288	110.746	124.880	103.058	121.054	115.397	134.811
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	6202.098	5725.000	5725.000	7633.297	8587.500	6011.199	6202.098	4293.797	6202.098	5725.000	9541.699	5725.000	6679.199	5725.000
O2 SUPPLIED/BOD REMOVED,LB/LB	0.891	0.741	0.798	1.020	0.987	0.743	1.240	0.730	0.905	0.740	1.501	0.772	0.928	0.676
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4640.094	5008.152	4240.070	4400.984	4154.621	4281.809	4202.301	4224.109	4215.547	3318.136	3397.315	3621.240	3970.616	3709.184
VSS,MG/L	3278.569	3670.623	3225.039	3345.851	2694.706	3183.188	3192.903	3192.777	3236.966	2549.779	2626.900	2808.699	3040.908	3333.470
SVI,ML/GTSS	77.400	76.650	78.400	68.350	82.300	79.100	83.900	78.800	73.050	75.050	74.250	72.400	71.650	77.650
ZSV,FT/HR	4.610	3.890	5.160	6.300	4.860	5.340	4.030	5.020	8.670	8.280	8.150	7.440	5.830	6.510
TEMPERATURE,C **	19.000	21.000	21.000	21.000	20.000	20.000	20.000	21.000	21.000	20.000	21.000	21.000	21.000	21.000
DETENTION TIME,HR	2.577	2.565	2.560	2.623	2.678	2.588	2.876	2.671	2.650	2.518	2.702	2.647	2.647	2.355
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	415.720	417.563	418.485	409.345	400.049	413.876	372.396	400.971	404.198	425.398	396.363	404.656	404.658	454.895
SOLIDS LOAD,LB/FT2/DAY	18.492	19.874	16.818	17.451	15.832	17.100	15.068	15.997	15.946	12.857	12.268	13.475	14.847	15.334
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	770.092	522.561	875.103	940.116	700.083	939.278	1365.161	554.233	735.087	857.601	735.087	933.443	670.913	433.634
RETURN SLUDGE														
RECYCLE TSS,MG/L	17250.000	18200.000	15613.000	17375.000	16875.000	16975.000	16538.000	17613.000	17488.000	18670.000	19688.000	19800.000	16463.000	17463.000
RECYCLE RATIO,(RQ)	19.734	18.698	18.381	21.287	18.975	20.523	20.260	17.966	16.887	13.770	13.791	14.852	15.410	13.506

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	9/30/72	10/ 1/72	10/ 2/72	10/ 3/72	10/ 4/72	10/ 5/72	10/ 6/72	10/ 7/72	10/ 8/72	10/ 9/72	10/10/72	10/11/72	10/12/72	10/13/72
INFLUENT WASTEWATER														
FLOW RATE(G),MGD	9.560	9.190	9.150	9.210	8.980	8.120	9.180	10.050	9.120	9.310	9.300	9.150	9.250	9.100
BOD5,MG/L	196.000	196.000	172.000	145.000	220.000	226.000	182.000	175.000	309.000	214.000	162.000	271.000	213.000	265.000
BOD5,SOL,MG/L	49.000	46.000	46.000	43.000	60.000	54.000	--	--	51.000	52.000	46.000	67.000	52.000	53.000
COD,MG/L	483.000	505.000	421.000	349.000	502.000	508.000	549.000	474.000	585.000	562.000	470.000	494.000	486.000	413.000
COD,SOL,MG/L	109.000	156.000	154.000	94.000	188.000	127.000	--	--	142.000	125.000	141.000	159.000	172.000	111.000
TSS,MG/L	162.000	222.000	196.000	183.000	232.000	188.000	210.000	199.000	286.000	206.000	260.000	236.000	170.000	164.000
VSS,MG/L	108.000	162.000	134.000	174.000	203.000	156.000	164.000	154.000	216.000	134.000	174.000	168.000	110.000	148.000
NH3-N,MG/L	--	16.760	15.070	15.900	15.900	15.190	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	3.450	0.200	0.300	0.400	0.400	--	--	--	--	--	--	--	--
PH	7.200	7.300	7.200	7.200	7.000	7.200	7.100	7.100	7.100	7.200	7.200	7.100	7.100	7.100
EFFLUENT														
BOD5,MG/L	12.000	10.300	10.000	20.000	7.000	9.000	8.000	11.000	11.000	11.000	9.000	18.000	12.000	7.000
BOD5,SOL,MG/L	2.000	2.000	1.000	2.000	2.000	6.000	--	--	2.000	2.000	2.000	3.000	2.000	2.000
COD,MG/L	66.000	59.000	54.000	79.000	71.000	67.000	94.000	47.000	63.000	66.000	63.000	56.000	71.000	44.000
COD,SOL,MG/L	39.000	47.000	42.000	28.000	47.000	36.000	--	--	28.000	35.000	27.000	32.000	43.000	32.000
TSS,MG/L	15.000	21.000	31.000	33.000	17.000	10.000	24.000	20.000	23.000	24.000	31.000	27.000	16.000	6.000
VSS,MG/L	6.000	12.000	17.000	25.000	16.000	8.000	17.000	17.000	14.000	13.000	15.000	13.000	5.000	5.000
NH3-N,MG/L	--	15.350	15.070	8.370	14.790	15.190	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	0.100	0.050	0.080	0.200	0.080	--	--	--	--	--	--	--	--
PH	7.000	7.000	7.000	7.100	7.000	7.000	6.900	6.800	7.000	7.000	6.900	6.900	7.100	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	93.878	94.898	94.186	86.207	96.818	96.016	95.604	93.714	96.440	94.860	94.444	93.358	94.366	96.585
COD REMOVED,%	86.335	88.200	87.471	77.364	85.857	86.811	82.878	90.084	89.231	88.256	86.596	88.664	85.391	89.346
TSS REMOVED,%	90.741	90.541	84.343	81.667	92.672	94.681	88.571	86.800	91.958	85.922	88.077	88.559	90.588	96.341
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.629	0.532	0.586	0.464	0.656	0.625	0.502	0.564	0.807	0.609	0.447	0.688	0.606	0.726
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	120.469	115.923	101.396	86.040	127.283	116.232	107.643	113.312	181.562	128.361	97.066	159.750	126.938	120.189
VAPCO PHASE DATA														
O2 SUPPLIED,FT3/HR	6202.098	3816.699	6202.098	4293.797	9541.699	3339.600	6202.098	4293.797	3625.799	5247.898	6870.000	4293.797	6202.098	4866.297
O2 SUPPLIED/BOD REMOVED,LB/LB	0.862	0.535	0.997	0.996	1.189	0.450	0.922	0.619	0.317	0.662	1.155	0.441	0.790	0.842
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3939.152	4369.590	3699.564	3890.512	3958.550	4081.975	4461.402	4275.207	4709.629	4610.293	4570.230	5090.906	4342.023	3588.987
VSS,MG/L	3071.240	3489.549	2772.080	2970.584	3109.811	3032.879	3436.467	3222.556	3608.232	3380.742	3477.315	3719.285	3356.987	2652.559
SVI,ML/GTSS	90.450	134.150	74.600	75.050	71.750	68.900	75.450	79.400	83.400	82.350	75.800	80.400	77.050	73.250
ZSV,FT/HR	4.200	1.420	7.800	6.920	6.570	6.790	5.440	4.530	3.300	3.810	5.400	3.040	4.970	7.760
TEMPERATURE,C **	19.000	19.000	19.000	23.000	19.000	20.000	20.000	20.000	23.000	19.000	18.000	20.000	21.000	20.000
DETENTION TIME,HR	2.436	2.532	2.540	2.523	2.588	2.662	2.532	2.313	2.548	2.496	2.499	2.540	2.513	2.554
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	439.686	423.094	421.711	424.477	413.876	374.240	423.094	463.191	420.328	429.065	428.625	421.711	426.320	419.407
SOLIDS LOAD,LB/FT2/DAY	15.850	17.006	14.304	15.116	15.057	14.133	17.312	18.021	19.467	16.331	18.463	20.484	17.419	13.850
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	617.781	1020.955	770.092	520.896	665.078	1107.632	1006.786	933.444	700.084	583.403	500.059	661.746	536.730	770.092
RETURN SLUDGE														
RECYCLE TSS,MG/L	19938.000	18112.000	19825.000	17760.000	19640.000	21610.000	16925.300	15453.000	16800.000	18750.000	16900.000	18210.000	17910.000	18240.000
RECYCLE RATIO,(%Q)	14.298	14.891	14.546	14.321	14.788	15.554	14.553	13.662	16.513	15.736	17.720	19.169	17.535	14.923

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR OVERFLOW)

APPENDIX A

DATE	10/14/72	10/15/72	10/16/72	10/17/72	10/18/72	10/19/72	10/20/72	10/21/72	10/22/72	10/23/72	10/24/72	10/25/72	10/26/72	10/27/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.400	9.360	9.430	9.210	9.190	9.610	9.020	9.280	8.980	9.190	8.960	8.880	8.560	7.960
BOD5,MG/L	195.000	181.000	183.000	260.000	225.000	206.000	156.000	174.000	151.000	276.000	190.000	217.000	179.000	178.000
BOD5,SOL,MG/L	54.000	50.000	47.000	64.000	52.000	54.000	--	--	18.000	66.000	34.000	48.000	56.000	48.200
COD,MG/L	444.000	444.000	370.000	404.000	472.000	422.000	500.000	404.000	281.000	529.000	435.000	441.000	342.000	387.000
COD,SOL,MG/L	127.000	189.000	63.000	124.000	157.000	125.000	--	--	78.000	156.000	124.000	91.000	92.000	95.000
TSS,MG/L	248.000	152.000	200.000	255.000	166.000	208.000	144.000	150.000	136.000	232.000	190.000	212.000	170.000	198.000
VSS,MG/L	190.000	126.000	158.000	180.000	120.000	179.000	126.000	130.000	113.000	204.000	152.000	169.000	130.000	164.000
NH3-N,MG/L	--	--	--	30.910	15.780	14.490	--	--	--	--	20.290	--	--	--
NO3-N,MG/L	--	--	--	0.400	0.230	0.180	--	--	--	--	0.239	--	--	--
PH	7.100	7.000	7.200	7.200	7.300	7.200	7.200	7.200	7.200	7.000	7.200	7.100	7.100	7.000
EFFLUENT														
BOD5,MG/L	10.000	20.000	11.000	12.000	11.000	9.000	5.000	8.000	9.000	12.000	11.000	10.000	12.000	11.000
BOD5,SOL,MG/L	2.000	5.000	3.000	4.000	4.000	2.000	--	--	2.000	3.000	2.000	2.000	3.000	2.000
COD,MG/L	56.000	87.000	59.000	58.000	71.000	62.000	70.000	59.000	45.000	62.000	85.000	53.000	51.000	71.000
COD,SOL,MG/L	28.000	43.000	31.000	23.000	47.000	31.000	--	--	39.000	35.000	43.000	23.000	23.000	36.000
TSS,MG/L	25.000	20.000	22.000	26.000	23.000	36.000	11.000	9.000	12.000	12.000	32.000	17.000	28.000	35.000
VSS,MG/L	16.000	16.000	20.000	14.000	14.000	32.000	11.000	9.000	10.000	11.000	25.000	14.000	20.000	29.000
NH3-N,MG/L	--	--	--	18.680	13.520	13.650	--	--	--	--	14.490	--	--	--
NO3-N,MG/L	--	--	--	0.230	0.050	0.100	--	--	--	--	0.090	--	--	--
PH	6.900	6.800	7.000	7.000	7.000	7.100	7.200	7.000	7.000	7.400	7.100	7.100	6.900	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	94.872	88.950	93.989	95.385	95.111	95.631	96.795	95.402	94.040	95.652	94.211	95.392	93.296	93.820
COD REMOVED,%	87.387	80.405	84.054	85.644	84.958	85.308	86.000	85.644	83.986	88.280	80.460	87.982	85.088	87.905
TSS REMOVED,%	89.919	86.842	89.000	89.600	86.145	82.692	92.361	94.000	91.176	94.828	83.158	91.981	83.529	82.323
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.570	0.507	0.585	0.756	0.596	0.634	0.455	0.480	0.345	0.699	0.495	0.553	0.419	0.369
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	118.096	109.150	111.182	154.278	133.220	127.544	90.657	104.032	87.362	163.416	109.681	124.149	98.718	91.286
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4293.797	6679.199	7633.297	10018.797	5725.000	5725.000	5247.898	9732.500	5725.000	8110.398	6679.199	7156.297	5438.797	5534.199
O2 SUPPLIED/BOD REMOVED,LB/LB	0.587	1.053	1.129	1.046	0.696	0.723	0.918	1.511	1.066	0.797	0.993	0.925	0.904	0.989
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4254.668	4502.777	3962.956	4171.957	4059.148	4092.275	4072.971	4437.297	5174.516	4773.887	4591.797	4627.043	4829.148	5160.668
VSS,MG/L	3321.359	3451.315	3047.613	3270.102	3085.161	3222.795	3195.534	3475.027	4055.496	3746.840	3552.011	3599.017	3780.013	3986.300
SVI,ML/GTSS	79.900	80.450	81.850	86.300	86.100	81.550	82.950	82.450	83.300	81.600	76.050	83.350	92.000	90.250
ZSV,FT/HR	4.530	4.130	5.270	4.440	3.480	4.660	4.060	3.670	3.200	3.060	4.200	3.620	3.410	5.790
TEMPERATURE,C **	20.000	20.000	17.000	19.000	18.000	18.000	19.000	18.000	20.000	19.000	19.000	20.000	20.000	20.000
DETENTION TIME,HR	2.472	2.483	2.465	2.523	2.529	2.418	2.577	2.504	2.588	2.529	2.594	2.617	2.715	2.920
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	433.233	431.390	434.616	424.477	423.555	442.912	415.720	427.703	413.876	423.555	412.954	409.267	394.519	366.886
SOLIDS LOAD,LB/FT2/DAY	16.863	18.427	16.539	16.953	19.572	17.822	16.988	18.861	21.557	20.337	19.116	19.094	19.579	19.923
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	939.279	700.083	630.075	733.838	745.923	886.773	525.062	933.445	775.926	665.079	735.087	816.764	895.940	612.573
RETURN SLUDGE														
RECYCLE TSS,MG/L	14550.000	15360.000	13950.000	15425.000	15510.000	15160.000	14720.000	14525.000	14725.000	16260.000	16420.000	15810.000	15060.000	15480.000
RECYCLE RATIO,(R)	14.245	18.483	19.636	19.566	23.874	22.610	25.310	24.256	25.724	25.626	25.915	25.935	28.353	31.432

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	10/29/72	10/30/72	10/31/72	11/ 1/72	11/ 2/72	11/ 3/72	11/ 4/72	11/ 5/72	11/ 6/72	11/ 7/72	11/ 8/72	11/ 9/72	11/10/72
INFLUENT WASTEWATER													
FLOW RATE(Q),MGD	10.200	8.520	6.350	7.150	8.050	9.250	9.070	9.030	8.410	8.610	9.460	10.810	10.740	9.440
BOD5,MG/L	163.000	181.000	212.000	176.000	176.000	196.000	180.000	195.000	238.000	147.000	135.000	111.000	141.000	169.000
BOD5,SOL,MG/L	32.000	37.000	42.000	45.000	45.000	49.000	--	--	56.000	47.000	39.000	21.000	28.000	--
COD,MG/L	422.000	364.000	467.000	371.000	371.000	508.000	492.000	472.000	529.000	369.000	395.000	315.000	362.000	365.000
COD,SOL,MG/L	141.000	95.000	109.000	93.000	93.000	77.000	--	--	125.000	125.000	126.000	63.000	71.000	79.000
TSS,MG/L	324.000	152.000	240.000	142.000	234.000	192.000	178.000	140.000	232.000	176.000	178.000	144.000	166.000	156.000
VSS,MG/L	144.000	116.000	168.000	128.000	178.000	152.000	161.000	138.000	182.000	140.000	162.000	110.000	130.000	146.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.100	7.000	6.900	7.200	7.200	7.200	6.800	7.200	7.200	7.300	7.300	7.200	7.200
EFFLUENT														
BOD5,MG/L	8.000	6.000	7.000	9.000	9.000	10.000	10.000	10.000	13.000	11.000	11.000	10.000	10.000	11.000
BOD5,SOL,MG/L	2.000	2.000	2.000	2.000	2.000	2.000	--	--	2.000	2.000	4.000	2.000	2.000	--
COD,MG/L	86.000	51.000	62.000	54.000	54.000	69.000	79.000	63.000	13.000	66.000	63.000	63.000	59.000	44.000
COD,SOL,MG/L	55.000	28.000	43.000	27.000	27.000	35.000	--	--	2.000	27.000	51.000	31.000	28.000	28.000
TSS,MG/L	27.000	11.000	30.000	40.000	29.000	15.000	19.000	19.000	45.000	20.000	20.000	36.000	25.000	16.000
VSS,MG/L	13.000	9.000	24.000	34.000	18.000	12.000	17.000	16.000	29.000	14.000	19.000	24.000	17.000	13.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.800	6.900	6.800	6.800	6.900	7.000	7.000	6.900	7.000	7.000	6.900	6.900	6.900	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	95.092	96.685	96.698	94.886	94.886	94.898	94.737	94.872	93.596	94.416	94.054	90.991	93.243	93.452
COD REMOVED,%	79.621	85.989	86.724	85.445	85.445	86.417	83.943	86.653	97.543	83.033	84.051	80.000	83.702	87.945
TSS REMOVED,%	91.667	92.763	87.500	71.831	87.607	92.188	89.326	89.444	80.693	88.636	88.764	75.000	84.940	89.744
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.574	0.419	0.344	0.327	0.368	0.465	0.473	0.502	0.462	0.482	0.494	0.550	0.625	0.614
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	107.117	99.355	86.732	81.076	91.281	116.807	111.028	113.447	109.993	111.818	112.755	77.307	102.409	102.177
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5725.000	6679.199	4770.797	5152.500	6297.500	6679.199	5247.898	5725.000	5247.898	6297.500	5725.000	3816.699	5247.898	4770.797
O2 SUPPLIED/BOD REMOVED,LB/LB	0.857	1.064	0.871	1.025	1.113	0.922	0.764	0.814	0.777	0.913	0.826	0.830	0.841	0.767
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3907.490	5152.898	5417.113	5338.605	5453.242	5051.152	4827.703	4753.773	5096.176	4965.930	4830.887	2883.973	3433.686	3449.901
VSS,MG/L	2989.443	3404.093	4038.593	3978.522	3979.584	4024.527	3758.976	3624.605	3816.763	3716.773	3657.589	2450.861	2625.155	2648.356
SVI,ML/GTSS	73.600	85.600	80.650	82.700	87.550	76.500	82.400	81.300	82.400	79.200	--	75.150	74.600	72.400
ZSV,FT/HR	5.790	2.170	3.160	3.065	2.560	4.030	5.150	5.850	4.340	4.060	--	10.600	8.560	8.500
TEMPERATURE,C **	21.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	21.000	20.000	20.000	20.000	20.000	19.000
DETENTION TIME,HR	2.279	2.728	3.660	3.251	2.887	2.513	2.562	2.574	2.764	2.638	2.457	2.150	2.164	2.462
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	470.104	392.675	292.663	329.534	371.014	426.320	418.024	416.181	387.676	406.041	435.999	498.219	494.992	435.077
SOLIDS LOAD,LB/FT2 DAY	18.297	20.750	17.289	18.492	20.240	21.416	20.203	19.901	20.159	20.388	20.684	13.312	15.799	14.213
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	655.911	1061.794	670.914	980.117	980.117	734.254	770.091	775.925	771.759	857.603	980.117	663.413	770.092	781.926
RETURN SLUDGE														
RECYCLE TSS,MG/L	16690.000	17425.000	17112.000	16812.500	18075.000	17525.000	18087.500	15775.000	15637.500	17450.000	17037.500	16025.000	17367.500	18187.500
RECYCLE RATIO,(RQ)	24.412	28.087	36.209	31.287	29.702	24.216	25.039	25.637	27.467	26.288	22.653	15.717	16.099	19.273

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	11/11/72	11/12/72	11/13/72	11/14/72	11/15/72	11/16/72	11/17/72	11/18/72	11/19/72	11/20/72	11/21/72	11/22/72	11/23/72	11/24/72
INFLUENT WASTEWATER														
FLOW RATE(S),MGD	9.630	9.870	9.530	10.700	10.630	9.190	8.820	8.740	10.860	11.630	11.020	10.430	9.590	9.850
BOD5,MG/L	140.000	139.000	176.000	111.000	122.000	116.000	113.000	123.000	115.000	126.000	152.000	175.000	215.000	230.000
BOD5,SOL,MG/L	--	26.000	41.000	13.000	28.000	25.000	--	--	23.000	25.000	49.000	49.000	63.000	54.000
COD,MG/L	367.000	474.000	439.000	287.000	299.000	287.000	220.000	332.000	378.000	222.000	267.000	383.000	376.000	474.000
COD,SOL,MG/L	97.000	190.000	94.000	64.000	63.000	46.000	--	--	47.000	32.000	31.000	128.000	118.000	174.000
TSS,MG/L	140.000	194.000	184.000	154.000	124.000	114.000	98.000	148.000	232.000	136.000	140.000	132.000	188.000	208.000
VSS,MG/L	104.000	120.000	152.000	112.000	108.000	82.000	98.000	120.000	148.000	120.000	106.000	112.000	136.000	176.000
NH3-N,MG/L	--	--	--	--	14.000	12.600	--	--	--	--	13.700	--	--	--
NO3-N,MG/L	--	--	--	--	0.180	0.230	--	--	--	--	0.250	--	--	--
PH	7.300	7.200	7.200	7.300	7.200	7.300	7.300	7.200	7.200	7.000	7.000	7.100	7.000	7.200
EFFLUENT														
BOD5,MG/L	10.000	10.000	9.000	9.000	10.000	9.000	10.000	12.000	12.000	6.000	9.000	10.000	10.000	15.000
BOD5,SOL,MG/L	--	2.000	2.000	2.000	2.000	2.000	--	--	3.000	2.000	2.000	2.000	3.000	3.000
COD,MG/L	54.000	87.000	63.000	56.000	59.000	64.000	51.000	67.000	51.000	40.000	49.000	52.000	35.000	51.000
COD,SOL,MG/L	46.000	59.000	43.000	36.000	12.000	20.000	--	--	23.000	24.000	12.000	36.000	27.000	36.000
TSS,MG/L	16.000	22.000	13.000	15.000	19.000	18.000	21.000	22.000	15.000	8.000	9.000	19.000	16.000	20.000
VSS,MG/L	11.000	16.000	11.000	12.000	17.000	15.000	18.000	19.000	14.000	8.000	3.000	16.000	15.000	19.000
NH3-N,MG/L	--	--	--	--	11.500	14.600	--	--	--	--	11.500	--	--	--
NO3-N,MG/L	--	--	--	--	0.400	0.400	--	--	--	--	0.300	--	--	--
PH	6.900	7.000	7.100	6.900	6.900	6.900	7.000	6.900	6.900	6.700	6.800	7.000	7.300	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	92.857	92.806	94.886	91.892	91.803	92.241	91.150	90.244	89.565	95.000	94.079	94.286	95.349	93.478
COD REMOVED,%	85.286	81.646	85.649	80.488	80.268	77.700	76.818	79.819	86.534	81.982	85.019	86.423	90.691	89.240
TSS REMOVED,%	88.571	88.660	92.935	90.260	84.677	83.929	78.571	85.135	93.534	94.118	93.571	85.606	91.489	90.385
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.486	0.511	0.611	0.490	0.577	0.404	0.342	0.320	0.331	0.532	0.587	0.639	0.590	0.688
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	86.861	88.390	108.063	76.521	83.553	68.682	64.212	69.261	80.463	91.461	107.919	117.596	132.840	145.960
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	6202.098	4293.797	6679.199	4961.699	3816.699	5247.898	4293.797	5247.898	4122.898	4770.797	3816.699	4293.797	4293.797	3816.699
O2 SUPPLIED/BOD REMOVED,LB/LB	1.177	0.801	1.000	1.084	0.767	1.272	1.127	1.289	0.874	0.946	0.577	0.595	0.521	0.431
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3691.182	3673.186	3636.237	3243.226	3057.453	3409.209	3977.469	4585.746	5175.859	3662.403	3872.466	3922.730	4695.391	4525.984
VSS,MG/L	2866.171	2773.686	2834.012	2535.595	2322.256	2725.793	3009.015	3471.765	3895.473	2754.736	2946.172	2948.755	3610.592	3400.552
SVI,ML/GTSS	74.750	74.000	73.050	65.050	67.800	70.600	70.700	73.400	75.700	64.200	69.350	67.850	71.200	69.700
ZSV,FT/HR	6.515	8.590	7.420	11.450	10.850	8.510	8.000	5.660	4.760	9.360	7.880	7.880	6.710	5.815
TEMPERATURE,C **	20.000	20.000	19.000	19.000	18.000	19.000	19.000	19.000	19.000	18.000	19.000	19.000	19.000	18.000
DETENTION TIME,HR	2.413	2.355	2.439	2.172	2.186	2.529	2.634	2.659	2.140	1.965	2.109	2.228	2.423	2.360
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	443.834	454.895	439.265	493.149	489.923	423.555	406.502	402.815	501.523	545.229	527.897	480.705	441.990	453.973
SOLIDS LOAD,LB/FT2/DAY	15.461	15.820	15.260	15.188	14.239	14.980	15.866	18.487	23.345	16.053	18.835	18.092	19.974	19.372
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	817.722	805.096	466.722	939.279	525.012	662.579	1102.631	945.112	775.926	1073.462	466.722	983.868	1541.851	1430.170
RETURN SLUDGE														
RECYCLE TSS,MG/L	19692.500	20387.500	19612.500	20550.000	18533.000	16062.500	17025.000	17950.000	16825.000	19525.000	18337.500	17937.500	18537.500	18537.500
RECYCLE RATIO,(RQ)	17.871	18.257	19.339	18.607	18.730	22.394	22.562	25.000	12.551	14.172	19.610	19.837	20.209	17.756

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	11/25/72	11/26/72	11/27/72	11/28/72	11/29/72	11/30/72	12/ 1/72	12/ 2/72	12/ 3/72	12/ 4/72	12/ 5/72	12/ 6/72	12/ 7/72	12/ 8/72
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.670	12.090	9.790	9.430	9.210	10.460	10.420	9.340	9.470	8.590	8.060	8.480	8.500	8.460
BOD5,MG/L	212.000	135.000	159.000	174.000	111.000	162.000	105.000	145.000	174.000	167.000	153.000	157.000	140.000	123.000
BOD5,SOL,MG/L	54.000	--	31.000	41.000	21.000	26.000	--	--	46.000	28.000	33.000	43.000	34.000	35.000
COD,MG/L	540.000	287.000	333.000	472.000	314.000	362.000	277.000	323.000	436.000	375.000	354.000	320.000	411.000	252.000
COD,SOL,MG/L	143.000	--	48.000	79.000	95.000	94.000	--	--	67.000	125.000	97.000	64.000	95.000	63.000
TSS,MG/L	228.000	182.000	126.000	224.000	120.000	210.000	122.000	169.000	152.000	152.000	180.000	142.000	172.000	152.000
VSS,MG/L	186.000	110.000	102.000	184.000	84.000	202.000	98.000	134.000	144.000	116.000	144.000	126.000	150.000	140.000
NH3-N,MG/L	--	--	--	--	12.600	--	--	--	--	--	14.600	--	--	--
NO3-N,MG/L	--	--	--	--	0.260	--	--	--	--	--	0.590	--	--	--
PH	7.200	6.900	7.000	7.100	7.200	7.100	7.100	7.100	7.300	7.200	7.200	7.100	7.100	7.100
EFFLUENT														
BOD5,MG/L	13.000	18.000	16.000	21.000	24.000	25.000	11.000	10.000	9.000	10.000	9.000	10.000	10.000	8.000
BOD5,SOL,MG/L	4.000	--	4.000	6.000	4.000	5.000	--	--	3.000	3.000	3.000	3.000	2.000	3.000
COD,MG/L	64.000	71.000	36.000	91.000	103.000	110.000	50.000	60.200	62.000	70.000	44.000	52.000	55.000	43.000
COD,SOL,MG/L	48.000	--	32.000	67.000	67.000	51.000	--	--	27.000	59.000	28.000	40.000	20.000	16.000
TSS,MG/L	35.000	28.000	20.000	42.000	39.000	45.000	23.000	17.000	12.000	14.000	23.000	18.000	14.000	16.000
VSS,MG/L	28.000	21.000	17.000	40.000	29.000	37.000	19.000	15.000	12.000	12.000	18.000	15.000	13.000	16.000
NH3-N,MG/L	--	--	--	--	14.600	--	--	--	--	--	23.000	--	--	--
NO3-N,MG/L	--	--	--	--	0.100	--	--	--	--	--	0.200	--	--	--
PH	7.100	6.900	6.900	7.000	7.200	6.800	6.900	7.000	7.300	7.100	7.100	7.300	7.100	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	93.866	86.667	89.937	87.931	78.378	84.568	89.524	93.103	94.828	94.012	94.118	93.631	92.857	93.496
COD REMOVED,%	88.148	75.261	89.189	80.720	67.405	69.613	81.949	81.362	84.729	81.333	87.571	83.750	86.618	82.936
TSS REMOVED,%	84.649	84.615	84.127	81.250	67.500	78.571	81.148	89.375	92.105	90.789	87.222	87.324	91.860	89.474
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.596	0.484	0.416	0.410	0.245	0.368	0.271	0.316	0.386	0.354	0.284	0.301	0.276	0.265
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	132.079	105.155	100.288	105.714	65.865	109.174	70.490	87.254	105.041	96.297	79.451	85.776	76.669	67.042
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4293.797	4770.797	3816.699	3816.699	3816.699	4770.797	4770.797	4102.898	4293.797	4770.797	4293.797	3339.600	4293.797	4770.797
O2 SUPPLIED/BOD REMOVED,LB/LB	0.534	0.807	0.652	0.633	1.139	0.799	1.169	0.778	0.667	0.812	0.885	0.641	0.933	1.177
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4691.500	4772.426	5323.270	5696.258	6219.414	6498.473	5661.340	6023.766	5913.868	5897.582	6020.387	6191.344	5960.977	5429.438
VSS,MG/L	3551.296	3479.976	3860.164	4131.051	4505.629	4754.957	4163.324	4428.547	4357.875	4360.594	4488.156	4568.766	4459.359	4049.081
SVI,ML/GTSS	72.400	38.500	29.000	30.150	26.900	54.950	57.200	--	69.550	56.050	60.300	66.100	65.050	57.200
ZSV,FT/HR	5.215	4.560	4.950	6.800	5.800	6.335	6.175	--	3.695	5.040	4.470	3.080	3.810	5.510
TEMPERATURE,C **	18.000	18.000	18.000	18.000	18.000	17.000	17.000	18.000	17.000	18.000	18.000	18.000	17.000	17.000
DETENTION TIME,HR	2.403	1.922	2.374	2.465	2.523	2.222	2.230	2.488	2.480	2.597	2.884	2.741	2.734	2.747
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	445.677	557.212	451.208	434.616	424.477	482.087	480.244	430.468	431.851	412.493	371.475	390.822	391.754	389.910
SOLIDS LOAD,LB/FT2/DAY	19.626	24.567	22.393	22.346	23.659	28.490	25.537	24.571	23.876	22.914	21.311	22.837	21.860	18.705
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	466.722	840.100	443.386	770.092	641.743	641.743	--	500.060	437.552	630.075	670.914	700.083	665.079	672.663
RETURN SLUDGE														
RECYCLE TSS,MG/L	20437.500	19162.500	20675.000	21612.500	26762.500	23200.000	23400.000	19812.500	20387.500	19875.000	23350.000	22675.000	20125.000	21737.500
RECYCLE RATIO,(%Q)	17.239	15.385	16.445	12.736	11.933	13.585	17.313	18.351	16.766	17.642	19.020	17.877	16.918	10.355

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	12/ 9/72	12/10/72	12/11/72	12/12/72	12/13/72	12/14/72	12/15/72	12/16/72	12/17/72	12/18/72	12/19/72	12/20/72	12/21/72	12/22/72
INFLUENT WASTEWATER														
FLOW RATE(G),MGD	11.600	10.990	10.690	9.580	9.330	9.680	9.780	10.960	10.140	9.670	10.010	9.510	9.220	9.600
BOD5,MG/L	87.000	83.000	130.000	102.000	97.000	160.000	104.000	90.000	133.000	143.000	182.000	175.000	164.000	90.000
BOD5,SOL,MG/L	21.000	21.000	27.000	23.000	20.000	30.000	--	--	36.000	38.000	36.000	37.000	38.000	20.000
COD,MG/L	125.000	207.000	309.000	267.000	283.000	352.000	223.000	175.000	320.000	316.000	286.000	300.000	329.000	220.000
COD,SOL,MG/L	47.000	112.000	66.000	79.000	95.000	96.000	--	--	112.000	126.000	52.000	111.000	188.000	78.000
TSS,MG/L	52.000	94.000	120.000	110.000	122.000	178.000	118.000	80.000	124.000	144.000	178.000	202.000	144.000	722.000
VSS,MG/L	32.000	86.000	118.000	94.000	104.000	129.000	102.000	74.000	108.000	124.000	164.000	122.000	--	668.000
NH3-N,MG/L	--	--	--	12.600	--	--	--	--	--	--	31.400	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	0.100	--	--	--
PH	7.100	7.100	7.100	7.100	7.200	7.290	7.100	7.100	7.100	7.100	7.200	7.100	7.200	7.100
EFFLUENT														
BOD5,MG/L	9.000	8.000	10.000	7.000	8.000	9.000	4.000	7.000	10.000	9.000	14.000	7.000	31.000	8.000
BOD5,SOL,MG/L	2.000	2.000	1.000	2.000	1.000	2.000	--	--	2.000	2.000	3.000	2.000	7.000	3.000
COD,MG/L	39.000	48.000	42.000	43.000	43.000	48.000	20.000	24.000	52.000	51.000	63.000	43.000	98.000	47.000
COD,SOL,MG/L	39.000	28.000	27.000	31.000	47.000	40.000	--	--	28.000	12.000	8.000	36.000	67.000	35.000
TSS,MG/L	15.000	19.000	17.000	15.000	10.000	19.000	3.000	11.000	18.000	20.000	26.000	28.000	35.000	25.000
VSS,MG/L	14.000	17.000	16.000	14.000	9.000	1.000	3.000	9.000	13.000	16.000	24.000	10.000	--	11.000
NH3-N,MG/L	--	--	--	12.600	--	--	--	--	--	--	12.000	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	0.200	--	--	--
PH	7.000	6.900	7.100	7.000	7.000	6.900	7.000	6.800	7.000	6.700	6.800	7.200	6.500	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	89.655	90.361	92.308	93.137	91.753	94.375	96.154	92.222	92.491	93.706	92.308	96.000	81.098	91.111
COD REMOVED,%	68.800	76.812	86.408	83.895	84.806	86.364	91.031	86.286	83.750	83.861	77.972	85.667	70.213	78.636
TSS REMOVED,%	71.154	79.787	85.833	86.364	91.803	89.326	97.458	86.250	85.494	86.111	85.393	86.139	75.694	96.537
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.348	0.331	0.391	0.257	0.224	0.394	0.267	0.283	0.404	0.370	0.488	0.407	0.450	0.426
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	65.020	58.715	89.535	62.956	58.307	99.785	65.530	63.667	86.888	89.091	117.375	107.223	97.419	55.665
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4770.797	4293.797	5725.000	4770.797	4675.398	4580.000	3816.699	3816.699	9541.699	4293.797	4293.797	3816.699	4484.598	4293.797
O2 SUPPLIED/BOD REMOVED,LB/LB	1.265	1.256	1.075	1.262	1.356	0.757	0.940	1.009	1.842	0.798	0.617	0.575	0.884	1.318
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4052.052	3816.644	4904.133	5218.391	5557.570	5446.207	5268.496	4846.039	4612.281	5119.133	5188.852	5525.574	4706.930	2805.342
VSS,MG/L	2994.820	2840.020	3674.529	3922.396	4169.719	4064.120	3934.190	3603.779	3447.209	3854.698	3856.236	4221.441	3473.609	2095.273
SVI,ML/GTSS	49.625	50.450	51.650	56.350	56.750	59.900	60.150	56.200	57.850	55.600	58.500	59.350	59.300	57.700
ZSV,FT/HR	10.160	9.465	7.750	7.105	5.800	5.605	5.945	8.220	8.400	6.435	6.580	5.555	7.430	1.375
TEMPERATURE,C **	17.000	16.000	16.000	16.000	16.000	15.000	16.000	16.000	16.000	16.000	15.000	16.000	15.000	15.000
DETENTION TIME,HR	2.004	2.117	2.174	2.426	2.491	2.401	2.376	2.117	2.292	2.403	2.322	2.444	2.521	2.421
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	534.629	506.353	492.688	441.529	430.007	446.138	450.747	506.053	467.339	445.677	461.347	438.303	424.937	442.451
SOLIDS LOAD,LB/FT2/DAY	18.228	16.631	22.134	21.582	22.249	22.291	21.457	22.006	19.748	20.348	22.119	21.085	19.806	10.782
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	620.490	1312.656	396.714	875.104	700.084	816.764	612.573	750.922	700.083	933.445	933.445	816.763	495.892	650.911
RETURN SLUDGE														
RECYCLE TSS,MG/L	22137.500	29125.000	21100.000	21000.000	17950.000	19987.500	21687.500	18712.500	17800.000	18825.000	18375.000	16287.500	15862.500	13575.000
RECYCLE RATIO,(%)	5.095	7.550	14.415	16.994	16.281	14.587	12.853	12.076	14.428	11.366	15.405	8.738	23.677	8.500

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	12/23/72	12/24/72	12/25/72	12/26/72	12/27/72	12/28/72	12/29/72	12/30/72	12/31/72	1/ 1/73	1/ 2/73	1/ 3/73	1/ 4/73	1/ 5/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.420	9.560	9.600	9.520	9.530	--	9.620	9.580	9.840	9.680	9.420	9.550	9.650	9.700
BOD5,MG/L	110.000	110.000	143.000	137.000	115.000	132.700	110.000	143.000	151.000	136.000	150.000	153.000	132.000	133.000
BOD5,SOL,MG/L	32.000	--	--	22.000	19.000	27.000	--	--	--	35.000	11.000	36.000	22.000	26.000
COD,MG/L	234.000	286.000	286.000	316.000	299.000	332.000	331.000	345.000	329.000	344.000	341.000	321.000	288.000	314.000
COD,SOL,MG/L	93.000	--	--	111.000	83.000	110.000	--	--	--	78.000	78.000	76.000	61.000	94.000
TSS,MG/L	91.000	146.000	152.000	140.000	144.000	150.000	144.000	148.000	109.000	134.000	129.000	120.000	128.000	112.000
VSS,MG/L	84.000	98.000	136.000	126.000	106.000	120.000	122.000	144.000	98.000	94.000	115.000	102.000	102.000	88.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.100	--	7.100	7.200	7.200	7.100	7.100	7.100	7.200	7.100	7.300	7.200	7.100	7.100
EFFLUENT														
BOD5,MG/L	7.000	9.000	8.000	6.000	7.000	5.000	7.000	8.000	7.000	8.000	49.000	11.000	15.000	12.000
BOD5,SOL,MG/L	7.000	--	--	2.000	1.000	3.000	--	--	--	2.000	4.000	3.000	2.000	4.000
COD,MG/L	27.000	52.000	44.000	36.000	51.000	47.000	51.000	51.000	43.000	55.000	149.000	46.000	57.000	59.000
COD,SOL,MG/L	4.000	--	--	32.000	20.000	40.000	--	--	--	23.000	46.000	34.000	27.000	31.000
TSS,MG/L	11.000	27.000	17.000	8.000	22.000	16.000	25.000	13.000	4.000	14.000	100.000	11.000	32.000	15.000
VSS,MG/L	11.000	14.000	15.000	7.000	15.000	13.000	15.000	13.000	3.000	9.000	99.000	8.000	19.000	10.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	--	6.900	6.900	6.900	7.000	6.900	7.000	7.100	6.900	7.000	7.000	7.100	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	93.636	91.818	94.406	95.620	93.913	96.232	93.636	94.406	95.364	94.118	67.333	92.810	88.636	90.977
COD REMOVED,%	88.462	81.818	84.615	88.608	82.943	85.843	84.592	85.217	86.930	84.012	56.305	85.670	80.208	81.210
TSS REMOVED,%	87.912	81.507	88.816	94.286	84.722	89.333	82.639	91.216	96.330	89.552	22.481	90.833	75.000	86.607
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.401	0.325	0.433	0.398	0.352	--	0.341	0.422	0.448	0.406	0.436	0.690	1.078	0.808
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	66.760	67.752	88.446	84.029	70.609	--	68.177	88.262	95.729	84.817	91.036	94.138	82.068	83.118
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4770.797	4007.500	3339.600	4389.199	3816.699	4770.797	3912.100	4198.297	2862.500	5725.000	3339.600	4484.598	4770.797	4770.797
O2 SUPPLIED/BOD REMOVED,LB/LB	1.188	1.003	0.621	0.848	0.493	9657.742	0.954	0.782	0.487	1.113	0.845	0.799	1.021	0.982
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3737.999	4459.297	4342.523	4435.637	4195.762	4506.676	4156.586	4446.688	4326.414	4494.836	4452.180	2975.502	1530.391	2170.501
VSS,MG/L	2669.794	3344.070	3273.956	3385.455	3214.122	3431.932	3201.455	3352.638	3421.198	3345.373	3348.166	2187.762	1220.314	1649.396
SVI,ML/GTSS	54.900	57.400	--	57.200	62.850	64.900	62.950	61.800	64.750	68.550	67.100	58.250	61.200	63.400
ZSV,FT/HR	9.630	8.695	--	8.665	8.260	8.060	8.330	6.570	6.830	5.610	5.900	9.600	37.400	21.000
TEMPERATURE,C **	15.000	15.000	16.000	16.000	16.000	14.000	15.000	16.000	16.000	16.000	16.000	15.000	15.000	15.000
DETENTION TIME,HR	2.467	2.431	2.421	2.441	2.439	--	2.416	2.426	2.362	2.401	2.467	2.434	2.408	2.396
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	434.155	440.638	442.451	439.764	439.225	--	443.373	441.524	453.512	446.138	434.155	440.147	444.755	447.060
SOLIDS LOAD,LB/FT2/DAY	14.626	17.962	17.418	17.630	16.546	2.932	17.530	18.776	18.621	19.329	18.504	12.385	6.803	9.414
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	550.065	450.054	595.071	420.050	816.764	775.928	840.101	725.067	700.083	700.083	857.603	816.776	662.578	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	15475.000	13925.000	12550.000	14625.000	13950.000	13637.500	14287.500	12550.000	14625.000	17975.000	15260.000	6880.000	7638.000	6963.000
RECYCLE RATIO,(RQ)	12.569	14.184	13.229	13.141	12.141	--	18.805	19.447	18.537	20.393	19.565	18.115	24.839	21.175

** BASED ON RAW WASTEWATER FLOW ONLY

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APPENDIX A

DATE	1/ 6/73	1/ 7/73	1/ 8/73	1/ 9/73	1/10/73	1/11/73	1/12/73	1/13/73	1/14/73	1/15/73	1/16/73	1/17/73	1/18/73	1/19/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.600	9.090	8.630	8.570	8.320	8.260	7.960	7.560	8.200	8.170	7.870	9.040	8.890	9.310
BOD5,MG/L	147.000	214.000	238.000	185.000	188.000	200.000	200.000	200.000	160.000	170.000	212.000	110.000	148.000	190.000
BOD5,SOL,MG/L	35.000	47.000	46.000	44.000	148.000	45.000	--	--	--	53.000	38.000	42.000	--	42.000
COD,MG/L	312.000	390.000	374.000	406.000	379.000	425.000	453.000	470.000	470.000	419.000	417.000	329.000	336.000	332.000
COD,SOL,MG/L	62.000	94.000	125.000	141.000	78.000	126.000	--	--	--	62.000	78.000	78.000	--	142.000
TSS,MG/L	128.000	188.000	214.000	158.000	162.000	154.000	212.000	222.000	136.000	190.000	174.000	164.000	116.000	150.000
VSS,MG/L	94.000	122.000	128.000	138.000	134.000	132.000	186.000	176.000	116.000	130.000	132.000	152.000	86.000	122.000
NH3-N,MG/L	--	--	--	--	--	12.300	--	--	--	--	12.900	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.100	7.100	7.200	7.400	7.100	7.200	7.100	7.200	7.100	7.000	7.100	7.200	7.100	7.100
EFFLUENT														
BOD5,MG/L	12.000	14.000	14.000	12.000	11.000	11.000	8.000	10.000	9.000	9.000	10.000	10.000	9.000	9.000
BOD5,SOL,MG/L	5.000	3.000	2.000	3.000	3.000	4.000	--	--	--	2.000	3.000	2.000	--	3.000
COD,MG/L	62.000	59.000	62.000	47.000	67.000	67.000	62.000	63.000	71.000	47.000	46.000	43.000	28.000	36.000
COD,SOL,MG/L	27.000	31.000	31.000	12.000	16.000	28.000	--	--	--	23.000	43.000	15.000	--	20.000
TSS,MG/L	18.000	24.000	36.000	14.000	17.000	67.000	14.000	16.000	8.000	16.000	14.000	14.000	8.000	7.000
VSS,MG/L	8.000	10.000	11.000	13.000	14.000	28.000	12.000	13.000	6.000	12.000	4.000	12.000	4.000	4.000
NH3-N,MG/L	--	--	--	--	--	12.000	--	--	--	--	11.000	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.000	7.100	6.900	6.900	6.800	7.000	6.900	7.100	7.100	7.000	7.000	7.000	7.300
TOTAL REMOVALS														
BOD5 REMOVED,%	91.837	93.458	94.118	93.514	94.149	94.500	96.000	95.000	94.375	94.706	95.283	90.909	93.919	95.263
COD REMOVED,%	80.128	84.872	83.422	88.424	82.322	84.235	86.313	86.596	84.894	88.783	88.969	86.930	91.667	89.157
TSS REMOVED,%	85.938	87.234	83.178	91.139	89.506	56.493	93.396	92.793	94.118	91.579	91.954	91.463	93.103	95.333
BIOMASS LOADING														
BOD5/DAY/#LVSS	0.715	0.847	0.898	0.630	0.611	0.567	0.500	0.454	0.449	0.492	0.522	0.340	0.457	0.595
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	90.920	125.328	135.397	102.147	100.775	106.434	102.569	97.801	84.529	89.483	107.493	64.067	84.769	113.966
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4770.797	4770.797	4293.797	4293.797	4293.797	6202.098	4293.797	4770.797	--	3339.600	4293.797	4293.797	4293.797	4770.797
O2 SUPPLIED/BOD REMOVED,LB/LB	0.890	0.634	0.526	0.700	0.707	0.963	0.681	0.802	--	0.614	0.653	1.148	0.840	0.684
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	2640.227	3041.823	3077.255	3273.755	3247.354	3699.008	3672.938	3892.596	3436.324	3539.678	4005.631	3876.756	3214.935	3567.107
VSS,MG/L	2036.897	2370.517	2415.574	2597.439	2645.099	3007.579	3285.319	3454.612	3014.733	2913.021	3330.764	3020.535	2974.961	3067.588
SVI,ML/GTSS	63.250	63.750	69.150	66.950	70.600	67.600	65.550	68.300	66.600	68.300	70.000	62.350	88.950	73.500
ZSV,FT/HR	9.410	9.280	8.060	8.740	8.320	7.690	6.580	6.210	8.140	7.750	6.540	7.230	6.210	6.530
TEMPERATURE,C **	15.000	15.000	14.000	15.000	14.000	14.000	14.000	14.000	14.000	15.000	15.000	15.000	15.000	15.000
DETENTION TIME,HR	2.421	2.557	2.632	2.712	2.793	2.814	2.920	3.062	2.834	2.845	2.953	2.571	2.614	2.496
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	442.451	418.946	406.963	394.980	383.458	380.692	366.866	349.813	377.927	376.544	362.718	416.641	409.728	429.085
SOLIDS LOAD,LB/FT2/DAY	10.392	12.079	12.054	11.625	10.629	12.768	14.015	13.271	12.494	12.806	14.066	15.284	10.546	12.255
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	--	--	350.042	266.365	--	--	233.361	--	--	525.062	221.693	--	830.933	780.093
RETURN SLUDGE														
RECYCLE TSS,MG/L	9275.000	9000.000	9375.000	11312.000	10825.000	12900.000	12450.000	13887.000	11475.000	14800.000	14800.000	15712.000	12338.000	14900.000
RECYCLE RATIO,(RQ)	11.115	18.383	20.215	12.287	6.611	13.245	20.100	21.726	20.159	20.000	20.915	18.186	--	--

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	1/20/73	1/21/73	1/22/73	1/23/73	1/24/73	1/25/73	1/26/73	1/27/73	1/28/73	1/29/73	1/30/73	1/31/73	2/ 1/73	2/ 2/73
INFLUENT WASTEWATER														
FLOW RATE(S),MGD	9.530	9.460	9.790	12.880	8.410	8.320	9.450	9.570	10.620	10.960	9.310	9.360	9.150	11.560
BOD5,MG/L	313.000	194.000	160.000	140.000	155.000	156.000	153.000	148.000	151.000	105.000	115.000	120.000	133.000	84.000
BOD5,SOL,MG/L	51.000	44.000	40.000	36.000	46.000	35.000	--	--	42.000	16.000	25.000	27.000	37.000	16.000
COD,MG/L	470.000	462.000	349.000	348.000	418.000	387.000	365.000	364.000	364.000	234.000	252.000	282.000	314.000	142.000
COD,SOL,MG/L	47.000	96.000	127.000	63.000	129.000	145.000	--	--	95.000	70.000	126.000	78.000	94.000	95.000
TSS,MG/L	268.000	143.000	172.000	144.000	132.000	166.000	206.000	224.000	156.000	144.000	118.000	114.000	100.000	93.000
VSS,MG/L	252.000	110.000	138.000	130.000	110.000	132.000	148.000	172.000	100.000	108.000	98.000	86.000	58.000	90.000
NH3-N,MG/L	--	13.800	--	14.500	12.200	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.100	7.200	7.000	--	7.200	7.200	7.100	7.100	7.100	7.200	7.000	7.000	7.300	7.100
EFFLUENT														
BOD5,MG/L	9.000	10.000	8.000	8.000	11.000	6.000	8.000	8.000	10.000	14.000	9.000	6.000	8.000	6.000
BOD5,SOL,MG/L	3.000	3.000	4.000	3.000	3.000	2.000	--	--	4.000	2.000	2.000	2.000	3.000	2.000
COD,MG/L	27.000	56.000	40.600	47.000	60.000	52.000	48.000	47.000	51.000	59.000	55.000	43.900	43.000	32.000
COD,SOL,MG/L	8.000	40.000	28.000	36.000	36.000	44.000	--	--	36.000	43.000	28.000	20.000	27.000	8.000
TSS,MG/L	13.000	9.000	10.000	12.000	11.000	12.000	15.000	18.000	14.000	29.000	21.000	10.000	6.000	6.000
VSS,MG/L	13.000	4.000	7.000	10.000	8.000	8.000	14.000	16.000	3.000	19.000	13.000	4.000	1.000	1.000
NH3-N,MG/L	--	11.700	--	--	11.900	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.900	7.000	6.900	--	7.200	7.000	7.100	7.000	7.200	7.200	6.800	6.900	7.000	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	97.125	94.845	95.000	94.286	92.903	96.872	94.771	94.595	93.377	86.667	92.174	95.000	93.985	92.857
COD REMOVED,%	94.255	87.879	88.539	86.494	85.646	86.563	86.849	87.088	85.989	74.786	78.175	84.752	86.306	77.465
TSS REMOVED,%	95.149	93.571	94.186	91.667	91.667	92.771	92.718	91.964	91.026	79.861	82.203	91.228	94.000	93.548
BIOMASS LOADING														
BOD5/DAY/ML VSS	1.007	0.594	0.451	0.652	0.422	0.394	0.455	0.574	0.459	0.493	0.365	0.437	0.435	0.396
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	192.180	118.240	100.919	116.176	89.984	83.622	93.152	91.253	103.317	74.143	68.979	72.365	78.405	62.562
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	3816.699	3816.699	3816.699	--	4293.797	3816.699	3816.699	3816.699	3530.398	4293.797	4293.797	4770.797	6202.098	3816.699
O2 SUPPLIED/BOD REMOVED,LB/LB	0.318	0.530	0.622	--	0.904	0.752	0.675	0.726	0.572	1.051	1.059	1.088	1.320	1.030
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3818.385	3903.922	4418.789	3526.182	3964.552	4275.055	4059.885	2892.176	4310.098	3155.996	4094.339	3402.781	3892.807	3337.427
VSS,MG/L	3059.162	3192.062	3586.362	2857.796	3188.929	3398.089	3284.579	2548.181	3635.997	2412.795	3203.827	2656.867	2891.545	2531.528
SVI,ML/GTSS	69.950	74.950	92.000	--	73.150	73.300	72.150	67.450	77.300	66.050	68.450	62.650	66.850	63.050
ZSV,FT/HR	6.080	5.250	1.910	--	5.730	4.190	5.040	10.030	4.460	9.320	6.320	7.880	8.050	8.460
TEMPERATURE,C **	15.000	15.000	14.000	2.900	--	14.000	14.000	--	14.000	12.000	13.000	13.000	13.000	13.000
DETENTION TIME,HR	2.439	2.457	2.374	1.804	2.764	2.793	2.459	2.429	2.188	2.121	2.496	2.483	2.540	2.010
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	439.225	435.999	451.208	593.622	387.606	383.458	435.538	441.069	489.462	505.132	429.085	431.390	421.711	532.785
SOLIDS LOAD,LB/FT2/DAY	13.428	13.628	15.963	16.759	12.303	13.125	18.115	11.458	20.138	15.142	16.933	13.794	15.238	16.190
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	840.933	787.594	670.913	1260.150	1102.632	1120.134	933.444	630.076	--	980.117	933.444	675.104	735.087	630.075
RETURN SLUDGE														
RECYCLE TSS,MG/L	14475.000	15425.000	15940.000	17925.000	16150.000	16812.000	39725.000	17913.000	17200.000	17688.000	17750.000	18625.000	19025.000	17012.500
RECYCLE RATIO,(%)	--	--	--	--	--	--	27.958	12.184	19.228	18.631	20.387	17.372	17.443	13.720

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	2/ 3/73	2/ 4/73	2/ 5/73	2/ 6/73	2/ 7/73	2/ 8/73	2/ 9/73	2/10/73	2/11/73	2/12/73	2/13/73	2/14/73	2/15/73	2/16/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.290	13.160	8.660	9.270	9.300	10.220	10.220	9.910	9.420	9.050	8.410	8.520	8.420	8.740
BOD5,MG/L	104.000	101.000	120.000	93.000	143.000	118.000	109.000	127.000	120.000	140.000	133.000	119.000	144.000	120.000
BOD5,SOL,MG/L	32.000	32.000	21.000	23.000	35.000	29.000	--	--	26.000	39.000	35.000	33.000	34.000	--
COD,MG/L	220.000	233.000	306.000	220.000	265.000	279.000	279.000	327.000	240.000	340.000	258.000	288.000	387.000	320.000
COD,SOL,MG/L	142.000	77.000	48.000	63.000	62.000	--	--	--	62.000	62.000	97.000	80.000	81.000	--
TSS,MG/L	70.000	94.000	122.000	60.000	114.000	134.000	99.000	160.000	136.000	144.000	135.000	146.000	164.000	130.000
VSS,MG/L	51.000	57.000	112.000	60.000	100.000	80.000	98.000	108.000	100.000	124.000	118.000	108.000	132.000	102.000
NH3-N,MG/L	--	--	--	9.700	--	--	--	--	--	--	13.200	--	--	--
NO3-N,MG/L	--	--	--	3.300	--	--	--	--	--	--	0.400	--	--	--
PH	7.000	7.000	7.100	7.100	7.200	--	7.000	7.200	--	7.000	7.000	7.200	7.000	7.100
EFFLUENT														
BOD5,MG/L	9.000	7.000	6.000	11.000	8.000	7.000	6.000	6.000	7.000	6.000	6.000	9.000	7.000	8.000
BOD5,SOL,MG/L	2.000	2.000	2.000	3.000	2.000	2.000	--	--	3.000	3.000	3.000	3.000	2.000	--
COD,MG/L	12.000	50.000	20.000	51.000	39.000	50.000	54.000	43.000	46.000	39.000	40.000	32.000	48.000	52.000
COD,SOL,MG/L	8.000	34.000	12.000	24.000	19.000	--	--	--	31.000	27.000	32.000	40.000	16.000	--
TSS,MG/L	7.000	3.000	7.000	8.000	24.000	19.000	11.000	12.000	9.000	3.000	5.000	16.000	14.000	23.000
VSS,MG/L	6.000	3.000	7.000	8.000	11.000	6.000	10.000	2.000	3.000	3.000	2.000	6.000	11.000	14.000
NH3-N,MG/L	--	--	--	9.600	--	--	--	--	--	--	13.500	--	--	--
NO3-N,MG/L	--	--	--	0.700	--	--	--	--	--	--	0.600	--	--	--
PH	6.700	7.000	7.000	7.100	7.300	--	6.900	6.800	--	6.800	7.100	7.000	7.000	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	91.346	93.069	95.000	88.172	94.406	94.068	94.495	95.276	94.167	95.714	95.489	92.437	95.139	93.333
COD REMOVED,%	94.545	78.261	93.464	76.818	85.283	82.079	80.645	86.850	86.471	88.529	84.496	88.889	87.597	83.750
TSS REMOVED,%	90.000	96.809	94.262	86.667	78.947	85.821	88.889	92.500	93.382	97.917	96.377	89.041	91.463	82.308
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.340	0.300	0.336	0.259	0.445	0.406	0.349	0.361	0.329	0.430	0.332	0.312	0.349	0.398
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	62.247	66.113	66.953	55.544	85.682	77.697	71.771	81.087	72.829	81.630	72.064	65.322	78.117	67.572
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	3339.600	4293.797	4293.797	3625.799	3816.699	3339.600	3339.600	--	--	2862.500	4293.797	6011.297	2767.100	3816.699
O2 SUPPLIED/BOD REMOVED,LB/LB	0.924	1.094	1.055	1.165	0.742	0.716	0.775	--	--	0.574	0.982	1.561	0.586	0.949
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3767.146	4570.254	4195.273	4559.871	3938.732	3985.429	4366.191	4314.758	4451.785	4018.574	4545.113	4357.793	4683.008	3538.312
VSS,MG/L	2933.461	3531.921	3191.083	3436.626	3086.576	3063.875	3293.755	3600.250	3548.659	3041.605	3477.573	3351.856	3586.947	2722.567
SVI,ML/GTSS	67.050	73.650	66.550	64.900	69.200	67.650	63.850	69.000	--	--	69.150	66.800	64.950	61.950
ZSV,FT/HR	6.810	3.940	5.190	4.710	5.870	6.090	5.160	5.260	--	5.240	4.300	5.430	5.600	7.590
TEMPERATURE,C **	12.000	13.000	14.000	12.000	12.000	13.000	12.000	12.000	12.000	13.000	12.000	13.000	12.000	13.000
DETENTION TIME,HR	2.502	2.288	2.684	2.507	2.499	2.274	2.274	2.345	2.467	2.568	2.764	2.728	2.760	2.659
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	428.164	468.261	399.128	427.242	428.625	471.026	471.026	456.739	434.155	417.102	387.606	392.675	388.066	402.815
SOLIDS LOAD,LB/FT2/DAY	15.365	19.900	15.650	17.778	15.015	17.383	18.565	17.856	17.758	15.394	16.428	15.936	16.914	13.186
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	1260.150	770.092	1207.644	700.083	837.601	775.926	793.429	816.764	396.714	945.113	1458.507	840.100	1050.124	840.100
RETURN SLUDGE														
RECYCLE TSS,MG/L	19662.500	22337.500	18067.000	17575.000	18712.500	19487.500	18862.500	17412.500	17237.500	16337.500	17262.500	18312.500	18212.500	18262.500
RECYCLE RATIO,(RQ)	18.977	16.142	17.032	13.981	11.086	15.656	12.750	13.169	14.756	14.707	16.468	16.315	16.247	15.549

** BASED ON RAW WASTEWATER FLOW ONLY

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APPENDIX A

DATE	2/17/73	2/18/73	2/19/73	2/20/73	2/21/73	2/22/73	2/23/73	2/24/73	2/25/73	2/26/73	2/27/73	2/28/73	3/ 1/73	3/ 2/73
INFLUENT WASTEWATER														
FLOW RATE(G),*MGD	6.800	4.570	10.230	9.210	8.680	9.310	9.310	9.960	9.420	9.930	10.390	10.560	10.250	10.290
BOD5,MG/L	175.000	153.000	185.000	122.000	134.000	140.000	120.000	119.000	150.000	185.000	140.000	144.000	163.000	163.000
BOD5,SOL,MG/L	42.000	32.000	37.000	26.000	39.000	27.000	--	--	36.000	--	--	--	--	37.000
COD,MG/L	382.000	307.000	414.000	270.000	315.000	315.000	348.000	349.000	333.000	472.000	295.000	308.000	291.000	367.000
COD,SOL,MG/L	96.000	64.000	112.000	79.000	110.000	79.000	--	--	111.000	--	--	--	--	112.000
TSS,MG/L	164.000	129.000	214.000	150.000	150.000	152.000	130.000	152.000	138.000	194.000	158.000	132.000	194.000	190.000
VSS,MG/L	128.000	116.000	130.000	117.000	114.000	108.000	122.000	120.000	130.000	150.000	116.000	125.000	162.000	144.000
NH3-N,MG/L	--	--	12.800	13.800	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	0.300	0.300	--	--	--	--	--	--	--	--	--	--
PH	7.100	--	7.200	7.200	7.300	7.200	7.100	7.200	7.100	7.000	7.000	6.900	7.200	7.100
EFFLUENT														
BOD5,MG/L	11.000	6.000	9.000	8.000	11.000	10.000	10.000	8.000	13.000	11.000	9.000	8.000	10.000	7.000
BOD5,SOL,MG/L	2.000	2.000	2.000	2.000	2.000	2.000	--	--	3.000	--	--	--	--	2.000
COD,MG/L	60.000	40.000	52.000	52.000	39.000	51.000	63.000	48.000	40.000	39.000	47.000	49.000	57.000	52.000
COD,SOL,MG/L	24.000	28.000	36.000	36.000	31.000	39.000	--	--	32.000	--	--	--	--	32.000
TSS,MG/L	24.000	8.000	24.000	12.000	13.000	15.000	13.000	10.000	15.000	12.000	15.000	9.000	16.000	13.000
VSS,MG/L	18.000	7.000	8.000	5.000	8.000	11.000	13.000	10.000	12.000	9.000	14.000	5.000	11.000	7.000
NH3-N,MG/L	--	--	13.400	12.600	--	--	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	0.300	0.300	--	--	--	--	--	--	--	--	--	--
PH	7.000	--	7.400	6.900	7.300	7.200	7.100	7.100	7.200	7.100	6.900	7.000	7.200	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	93.714	96.078	95.135	93.443	91.791	92.857	91.667	93.277	91.333	94.054	93.571	94.444	93.865	95.706
COD REMOVED,%	84.293	86.799	87.440	80.741	87.619	83.810	81.897	86.246	87.988	91.737	84.068	84.091	80.412	85.831
TSS REMOVED,%	85.366	93.750	88.785	92.000	91.333	90.132	90.000	93.421	89.130	93.814	90.506	93.182	91.753	93.158
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.681	0.475	0.712	0.413	0.433	0.478	0.422	0.364	0.460	0.493	0.421	0.460	0.523	0.504
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	99.218	84.478	121.932	72.392	74.937	83.975	71.978	76.362	91.036	118.356	93.716	97.971	107.642	108.062
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	3816.699	3816.699	4293.797	3339.600	4293.797	3721.299	4580.000	4961.699	5534.199	4675.398	4770.797	5247.898	4293.797	4770.797
O2 SUPPLIED/BOD REMOVED,LB/LB	0.646	0.737	0.580	0.774	0.979	0.748	1.092	1.092	1.044	0.656	0.853	0.889	0.666	0.723
AERATION BASIN DATA														
MIXED LIQUOR	3088.326	3707.566	3466.710	3655.932	3526.912	3621.475	3490.526	3876.078	3763.804	4869.250	4523.449	4157.668	4084.921	4287.207
TSS,MG/L	2334.873	2849.372	2745.609	2807.599	2775.191	2818.602	2734.426	3363.245	3169.863	3851.447	3569.138	3411.212	3300.037	3437.589
VSS,MG/L	56.000	62.400	65.700	58.950	61.050	63.250	56.950	55.950	56.250	58.100	52.950	51.850	54.050	51.600
SVI,ML/GTSS	9.170	6.200	6.900	8.000	8.100	8.400	8.800	6.200	7.400	4.800	6.500	7.300	6.510	6.950
ZSV,FT/HR	12.000	13.000	13.000	13.000	13.000	13.000	12.000	13.000	13.000	14.000	13.000	13.000	13.000	13.000
TEMPERATURE,C **	2.641	2.712	2.272	2.523	2.678	2.496	2.496	2.333	2.467	2.341	2.237	2.201	2.267	2.259
DETENTION TIME,HR														
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	405.580	394.980	471.487	424.477	400.049	429.085	429.085	459.043	434.155	457.660	478.861	486.696	472.409	474.252
SOLIDS LOAD,LB/FT2/DAY	11.701	13.633	14.794	14.250	13.102	14.240	13.795	16.174	14.922	20.277	19.604	18.245	17.445	18.229
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	595.071	420.050	583.403	735.087	650.042	805.096	696.750	665.079	116.681	886.772	775.926	894.249	560.067	525.062
RETURN SLUDGE														
RECYCLE TSS,MG/L	16862.500	19587.530	14875.000	17837.500	18412.500	16200.000	18387.500	17137.500	17725.000	22162.500	21925.000	22325.000	23200.000	26775.000
RECYCLE RATIO,(RQ)	16.682	16.278	13.050	14.691	15.979	14.456	15.038	13.534	14.055	13.646	13.041	12.614	12.907	11.983

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	3/ 3/73	3/ 4/73	3/ 5/73	3/ 6/73	3/ 7/73	3/ 8/73	3/ 9/73	3/10/73	3/11/73	3/12/73	3/13/73	3/14/73	3/15/73	3/16/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	9.720	9.130	10.000	8.860	10.450	10.770	10.240	10.430	10.250	10.520	10.070	9.910	10.070	10.440
BOD5,MG/L	173.000	148.000	147.000	138.000	160.000	130.000	107.000	144.000	165.000	155.000	177.000	185.000	193.000	145.000
BOD5,SOL,MG/L	35.000	35.000	36.000	28.000	37.000	38.000	--	--	40.000	38.000	37.000	35.000	46.000	--
COD,MG/L	378.000	297.000	342.000	348.000	384.000	331.000	323.000	368.000	384.000	348.000	423.000	267.000	453.000	321.000
COD,SOL,MG/L	126.000	62.000	93.000	79.000	112.000	98.000	--	--	144.000	95.000	94.000	125.000	125.000	209.000
TSS,MG/L	172.000	162.000	162.000	--	136.000	128.000	110.000	170.000	144.000	154.000	190.000	126.000	198.000	168.000
VSS,MG/L	144.000	104.000	128.000	--	122.000	108.000	102.000	118.000	122.000	116.000	136.000	102.000	150.000	108.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	12.000	13.900	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	0.050	--	--	--	--
PH	7.200	7.100	7.200	7.000	7.100	7.000	7.100	7.000	6.900	6.900	6.900	6.900	6.900	7.100
EFFLUENT														
BOD5,MG/L	10.000	7.000	9.000	10.000	10.000	9.000	9.000	8.000	10.000	6.000	12.000	9.000	10.000	7.000
BOD5,SOL,MG/L	4.000	4.000	2.000	3.000	2.000	4.000	--	--	3.000	3.000	4.000	3.000	3.000	--
COD,MG/L	43.000	35.000	54.000	63.000	60.000	39.000	53.000	52.000	68.000	47.000	59.000	35.000	59.000	64.000
COD,SOL,MG/L	43.000	31.000	35.000	36.000	48.000	31.000	--	--	48.000	16.000	31.000	24.000	39.000	56.000
TSS,MG/L	14.000	7.000	12.000	--	12.000	10.000	8.000	11.000	13.000	8.000	17.000	10.000	21.000	14.000
VSS,MG/L	9.000	5.000	7.000	--	10.000	9.000	7.000	6.000	10.000	3.000	6.000	6.000	12.000	3.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	10.300	12.900	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	0.050	--	--	--	--
PH	6.900	7.000	7.000	6.900	7.000	6.900	6.900	6.700	7.000	6.700	7.000	6.900	6.800	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	94.220	95.270	93.878	92.754	93.750	93.077	91.589	94.444	93.939	96.129	93.220	95.135	94.819	95.172
COD REMOVED,%	88.624	89.215	84.211	81.897	84.375	88.218	83.591	85.870	82.292	86.494	86.052	86.891	86.976	80.062
TSS REMOVED,%	91.860	95.679	92.593	--	91.176	92.188	92.727	93.529	90.972	94.805	91.053	92.063	89.394	91.667
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.475	0.299	0.387	0.304	0.447	0.384	0.287	0.346	0.403	0.433	0.451	0.445	0.461	0.396
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	109.339	87.057	94.706	78.952	107.723	90.205	70.592	96.765	108.963	105.055	114.835	118.118	125.215	97.530
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4293.797	4770.737	7347.098	5534.199	5725.000	4770.797	4770.797	4293.797	5247.898	5725.000	5534.199	4770.797	4770.797	4770.797
O2 SUPPLIED/BOD REMOVED,LB/LB	0.660	0.902	1.296	1.185	0.889	0.891	1.157	0.734	0.804	0.886	0.808	0.663	0.628	0.800
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4827.754	5805.977	5001.246	5270.031	4905.934	4726.430	4969.953	5215.793	5252.793	4904.457	5273.855	5310.371	5571.109	5080.215
VSS,MG/L	3658.026	4665.469	3924.033	4162.570	3863.631	3766.483	3945.565	4478.196	4332.936	3892.387	4082.614	4452.160	4356.285	3950.180
SVI,ML/GTSS	54.750	59.700	61.250	61.650	60.050	59.400	61.650	65.000	65.100	62.500	61.950	62.150	66.550	60.950
ZSV,FT/HR	5.055	3.275	4.700	5.540	4.715	4.790	4.462	3.980	4.475	4.775	4.155	4.235	4.065	4.470
TEMPERATURE,C **	13.000	13.000	13.000	13.000	13.000	13.000	13.000	14.000	13.000	14.000	14.000	14.000	14.000	15.000
DETENTION TIME,HR	2.391	2.546	2.324	2.617	2.224	2.158	2.270	2.228	2.267	2.209	2.308	2.345	2.308	2.226
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	447.982	420.793	460.887	439.267	481.626	498.375	471.948	480.758	472.409	484.853	464.113	456.739	464.113	481.166
SOLIDS LOAD,LB/FT2/DAY	19.988	22.296	21.223	20.186	21.633	21.400	21.530	22.981	22.775	21.753	22.905	24.555	24.196	22.758
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	886.772	525.062	735.048	495.893	775.928	720.503	942.612	1155.137	886.773	840.100	942.195	942.196	933.445	828.849
RETURN SLUDGE														
RECYCLE TSS,MG/L	13670.000	25725.000	23146.000	25183.000	19487.500	19425.000	18800.000	19712.500	19412.500	18075.000	19487.500	19262.500	16787.500	16687.500
RECYCLE RATIO,(R)	15.432	13.987	15.000	16.892	14.354	13.923	14.448	14.382	14.634	14.254	16.882	21.857	16.882	16.284

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING SCUM BLANKET)

APPENDIX A

DATE	3/17/73	3/18/73	3/19/73	3/20/73	3/21/73	3/22/73	3/23/73	3/24/73	3/25/73	3/26/73	3/27/73	3/28/73	3/29/73	3/30/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.200	10.840	10.490	10.440	10.760	10.500	10.540	10.160	9.680	10.900	9.980	9.900	10.460	10.480
BOD5,MG/L	173.000	145.000	175.000	162.000	150.000	160.000	124.000	170.000	224.000	140.000	166.000	154.000	140.000	130.000
BOD5,SOL,MG/L	--	38.000	41.000	38.000	31.000	35.000	--	--	51.000	30.000	34.000	34.000	31.000	26.000
COD,MG/L	403.000	336.000	402.000	416.000	351.000	315.000	395.000	316.000	455.000	249.000	395.000	411.000	329.000	268.000
COD,SOL,MG/L	--	160.000	209.000	64.000	112.000	79.000	--	--	157.000	62.000	79.000	79.000	78.000	63.000
TSS,MG/L	174.000	138.000	162.000	178.000	174.000	182.000	170.000	162.000	192.000	112.000	150.000	156.000	148.000	148.000
VSS,MG/L	96.000	112.000	112.000	134.000	120.000	126.000	118.000	138.000	172.000	90.000	130.000	130.000	126.000	124.000
NH3-N,MG/L	--	12.500	--	--	11.500	--	--	--	15.000	--	--	--	14.300	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	0.200	--
PH	6.700	6.900	7.100	6.900	7.000	7.000	7.200	7.200	7.100	7.100	7.100	7.100	7.100	7.000
EFFLUENT														
BOD5,MG/L	9.000	8.000	21.000	10.000	10.000	8.000	15.000	9.000	10.000	9.000	7.000	8.000	6.000	2.000
BOD5,SOL,MG/L	--	3.000	3.000	3.000	3.000	3.000	--	--	4.000	3.000	3.000	3.000	2.000	2.000
COD,MG/L	52.000	60.000	76.000	64.000	60.000	55.000	75.000	47.000	63.000	54.000	51.000	51.000	55.000	47.000
COD,SOL,MG/L	--	48.000	40.000	48.000	36.000	39.000	--	--	43.000	35.000	36.000	36.000	31.000	39.000
TSS,MG/L	7.000	11.000	15.000	13.000	20.000	20.000	22.000	11.000	11.000	10.000	10.000	5.000	10.000	9.000
VSS,MG/L	--	6.000	13.000	8.000	8.000	11.000	14.000	9.000	9.000	7.000	9.000	5.000	10.000	2.000
NH3-N,MG/L	--	12.600	--	--	10.300	--	--	--	15.000	--	--	--	11.800	--
NO3-N,MG/L	--	0.500	--	--	--	--	--	--	--	--	--	--	0.160	--
PH	6.900	6.700	7.100	6.800	7.000	7.000	7.200	7.100	7.100	7.100	7.100	7.100	7.200	7.100
TOTAL REMOVALS														
BOD5 REMOVED,%	94.798	94.483	88.000	93.827	93.333	95.000	87.903	94.706	95.536	93.571	95.783	94.805	95.714	98.462
COD REMOVED,%	87.065	82.143	81.095	84.615	82.906	82.540	81.013	85.127	86.154	78.313	87.089	87.591	83.283	82.463
TSS REMOVED,%	95.977	92.029	90.741	92.697	88.506	89.011	87.059	93.210	94.271	91.071	93.333	96.795	93.243	93.919
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.475	0.387	0.467	0.437	0.521	0.547	0.369	0.551	0.671	0.540	0.536	0.465	0.474	0.433
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	113.689	101.267	118.273	108.965	103.986	108.236	84.204	111.279	139.699	98.316	106.736	98.226	94.348	87.776
VAPOR TABLE CCTT														
O2 SUPPLIED,FT3/HR	5725.000	4770.797	4770.797	3816.699	4770.797	4293.797	4293.797	770.797	4293.797	4293.797	4293.797	6688.297	4293.797	4293.797
O2 SUPPLIED/BOD REMOVED,LB/LB	0.830	0.782	0.716	0.583	0.768	0.652	0.906	0.707	0.503	0.727	0.656	1.085	0.740	0.774
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	5041.512	5597.625	5268.555	5209.223	4181.563	4095.005	4707.813	4190.906	4244.559	3758.838	4084.943	4683.613	4062.406	4134.070
VSS,MG/L	3838.580	4198.066	4062.890	3995.665	3196.642	3168.956	3654.580	3234.447	3339.447	2919.989	3189.217	3383.649	3190.456	3251.967
SVI,ML/GTSS	57.200	70.500	63.450	65.300	58.000	56.050	63.250	57.000	56.050	58.550	51.100	51.600	51.050	50.050
ZSV,FT/HR	4.350	2.345	4.740	4.310	6.920	7.580	3.690	6.830	6.980	7.920	7.660	7.760	7.800	7.700
TEMPERATURE,C **	14.000	13.000	14.000	14.000	14.000	14.000	14.000	14.000	14.000	15.000	14.000	15.000	15.000	15.000
DETENTION TIME,HR	2.279	2.144	2.216	2.226	2.160	2.213	2.205	2.288	2.401	2.132	2.329	2.348	2.222	2.218
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	472.104	499.201	483.473	481.166	495.914	483.931	485.774	468.261	446.138	502.366	459.965	456.278	482.087	483.009
SOLIDS LOAD,LB/FT2/DAY	22.138	25.902	23.699	23.336	19.226	18.435	21.263	18.341	17.824	17.477	17.606	18.336	18.078	18.580
SLUDGE WASTED														
SOLIDS WASTED,LB/HR ***	616.744	1323.872	775.426	991.786	945.114	886.773	850.935	788.010	466.721	972.616	980.116	892.606	735.087	694.250
RETURN SLUDGE														
RECYCLE TSS,MG/L	16025.000	18225.000	17550.000	17412.500	18150.000	17750.000	20237.500	18562.500	16725.000	18287.500	21550.000	16750.000	20825.000	19750.000
RECYCLE RATIO,(%Q)	16.667	15.683	16.206	16.284	15.799	16.190	16.129	16.732	17.562	15.596	17.034	17.172	15.296	16.221

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WITH [illegible])

APPENDIX A

DATE	3/31/73	4/ 1/73	4/ 2/73	4/ 3/73	4/ 4/73	4/ 5/73	4/ 6/73	4/ 7/73	4/ 8/73	4/ 9/73	4/10/73	4/11/73	4/12/73	4/13/73
INFLUENT WASTEWATER														
FLOW RATE(C),MGD	10.740	11.310	10.660	10.480	11.260	10.570	10.720	10.250	10.770	10.340	11.500	10.640	11.860	12.280
BOD5,MG/L	128.000	109.000	110.000	131.000	119.000	112.000	129.000	125.000	134.000	134.000	130.000	120.000	127.000	132.000
BOD5,SOL,MG/L	25.000	19.000	21.000	31.000	21.000	28.000	--	24.000	25.000	37.000	25.000	8.000	12.000	28.000
COD,MG/L	298.000	267.000	250.000	250.000	326.000	239.000	253.000	283.000	331.000	282.000	249.000	265.000	286.000	323.000
COD,SOL,MG/L	78.000	47.000	55.000	94.000	124.000	143.000	--	51.000	173.000	78.000	93.000	109.000	80.000	65.000
TSS,MG/L	170.000	140.000	114.000	90.000	128.000	88.000	128.000	140.000	134.000	146.000	132.000	144.000	136.000	132.000
VSS,MG/L	135.000	92.000	68.000	78.000	106.000	84.000	104.000	120.000	100.000	122.000	86.000	124.000	120.000	100.000
NH3-N,MG/L	--	--	--	12.600	--	--	--	--	12.100	--	--	12.300	12.900	13.200
NO3-N,MG/L	--	--	--	0.200	--	--	--	--	0.200	--	--	--	0.600	0.400
PH	7.100	7.000	7.000	7.100	7.000	7.000	7.100	7.000	7.000	7.100	7.000	7.000	7.200	7.100
EFFLUENT														
BOD5,MG/L	9.000	6.000	5.000	6.000	7.000	6.000	6.000	7.000	6.000	6.000	9.000	7.000	11.000	10.000
BOD5,SOL,MG/L	3.000	2.000	2.000	2.000	2.000	2.000	--	2.000	3.000	2.000	2.000	2.000	4.000	5.000
COD,MG/L	59.000	27.000	39.000	43.000	50.000	40.000	32.000	31.000	55.000	39.000	47.000	39.000	44.000	60.000
COD,SOL,MG/L	51.000	24.000	35.000	35.000	43.000	32.000	--	16.000	47.000	35.000	39.000	35.000	36.000	48.000
TSS,MG/L	20.000	16.000	11.000	3.000	11.000	5.000	11.000	6.000	14.000	5.000	11.000	9.000	10.000	10.000
VSS,MG/L	16.000	7.000	2.000	1.000	9.000	4.000	4.000	4.000	7.000	4.000	7.000	8.000	10.000	6.000
NH3-N,MG/L	--	--	--	10.600	--	--	--	--	10.600	--	--	11.200	10.100	11.200
NO3-N,MG/L	--	--	--	0.400	--	--	--	--	0.300	--	--	--	0.400	0.300
PH	6.900	7.100	7.000	6.900	7.000	7.000	7.000	7.000	7.000	6.900	6.800	6.900	7.000	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	92.969	94.495	95.455	95.420	94.118	94.643	95.349	94.400	95.522	95.522	91.000	94.167	91.339	92.424
COD REMOVED,%	80.201	89.888	84.400	82.800	84.663	83.264	87.352	89.046	83.384	86.170	81.124	85.283	84.722	81.424
TSS REMOVED,%	88.235	88.571	90.351	96.667	91.406	94.318	91.406	95.714	89.552	96.575	89.216	93.750	92.647	92.424
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.461	0.424	0.398	0.424	0.424	0.407	0.465	0.471	0.528	0.471	0.424	0.454	0.579	0.637
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	88.570	79.426	75.548	88.451	86.329	76.272	89.095	82.548	92.980	89.268	74.092	82.261	97.042	104.434
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4770.797	4770.848	4770.848	4770.848	4866.270	3816.680	3816.680	4293.758	4484.598	3816.680	--	3816.680	3339.600	4770.848
O2 SUPPLIED/BOD REMOVED,LB/LB	0.902	0.990	1.030	0.883	0.933	0.826	0.702	0.858	0.786	0.697	--	0.770	0.589	0.770
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4613.477	4135.176	4007.302	4398.680	4192.805	3897.956	3960.622	3695.755	3662.935	3946.394	3623.836	3783.000	3448.834	3327.881
VSS,MG/L	3078.804	2909.376	3041.058	3347.173	3262.477	3000.705	3068.926	2808.090	2821.340	3040.347	2803.905	2905.191	2688.603	2628.579
SVI,ML/GTSS	49.400	50.500	49.550	51.250	49.850	49.200	51.950	53.500	53.650	50.500	50.450	49.650	50.350	52.400
ZSV,FT/HR	7.120	8.100	8.370	7.025	8.650	10.550	9.560	9.460	8.670	9.055	8.995	9.195	10.555	11.000
TEMPERATURE,F **	15.000	15.000	15.000	14.000	15.000	14.000	14.000	15.000	15.000	15.000	14.000	14.000	14.000	15.000
DETENTION TIME,HR	2.164	2.055	2.180	2.218	2.064	2.199	2.168	2.267	2.158	2.248	2.021	2.184	1.960	1.893
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	494.992	521.263	491.305	483.009	518.958	487.157	494.070	472.409	496.375	476.557	510.020	490.384	546.611	565.969
SOLIDS LOAD,LB/FT2/DAY	21.178	19.852	18.351	19.770	20.051	17.649	18.152	16.297	16.855	17.533	17.651	17.226	17.257	17.178
SLUDGE WASTED														
***														
SOLIDS WASTED,LB/HR	695.083	420.049	595.070	991.783	830.075	965.111	793.427	735.087	350.042	945.112	1039.290	991.784	1050.124	793.427
RETURN SLUDGE														
RECYCLE TSS,MG/L	18312.500	22412.500	19475.000	20125.000	20625.000	20362.500	21162.500	18325.000	16100.000	19550.000	20387.500	19987.500	17050.000	17025.000
RECYCLE RATIO,(R)	15.829	15.031	16.417	16.221	15.098	16.083	15.858	16.585	15.765	16.441	14.783	15.977	14.334	13.844

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	4/14/73	4/15/73	4/16/73	4/17/73	4/18/73	4/19/73	4/20/73	4/21/73	4/22/73	4/23/73	4/24/73	4/25/73	4/26/73	4/27/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	12.700	13.500	12.760	12.510	13.060	13.060	13.690	13.090	12.550	12.750	13.550	12.710	12.520	11.810
BOD5,MG/L	115.000	129.000	143.000	160.000	142.000	138.000	122.000	138.000	130.000	168.000	168.000	154.000	136.000	108.000
BOD5,SOL,MG/L	27.000	25.000	30.000	24.000	28.000	31.000	25.000	33.000	25.000	41.000	32.000	36.000	25.000	22.000
COD,MG/L	319.000	351.000	239.000	328.000	358.000	341.000	375.000	341.000	308.000	462.000	346.000	360.000	342.000	253.000
COD,SOL,MG/L	96.000	143.000	96.000	47.000	109.000	62.000	74.000	81.000	62.000	80.000	31.000	109.000	94.000	95.000
TSS,MG/L	128.000	122.000	116.000	126.000	114.000	120.000	138.000	120.000	132.000	158.000	182.000	150.000	164.000	114.000
VSS,MG/L	100.000	112.000	106.000	106.000	96.000	108.000	114.000	108.000	112.000	134.000	134.000	140.000	134.000	90.000
NH3-N,MG/L	--	11.600	--	12.600	15.800	14.900	--	--	13.200	14.400	16.700	18.600	16.600	11.600
NO3-N,MG/L	--	0.200	--	0.500	0.100	0.600	--	--	0.200	0.200	0.800	0.200	0.200	0.800
PH	7.000	7.100	7.100	7.000	7.000	7.100	7.100	7.100	7.100	7.000	7.100	7.300	7.200	7.300
EFFLUENT														
BOD5,MG/L	9.000	7.000	7.000	18.000	8.000	11.000	8.000	11.000	9.000	11.000	13.000	11.000	14.000	10.000
BOD5,SOL,MG/L	3.000	3.000	2.000	5.000	3.000	4.000	3.000	2.000	3.000	4.000	5.000	3.000	13.000	3.000
COD,MG/L	48.000	44.000	24.000	55.000	62.000	47.000	62.000	54.000	54.000	80.000	67.000	63.000	71.000	51.000
COD,SOL,MG/L	36.000	40.000	24.000	27.000	43.000	31.000	31.000	31.000	23.000	36.000	35.000	35.000	35.000	36.000
TSS,MG/L	9.000	5.000	6.000	31.000	7.000	9.000	16.000	16.000	9.000	10.000	26.000	14.000	29.000	21.000
VSS,MG/L	9.000	5.000	6.000	26.000	6.000	8.000	10.000	7.000	6.000	7.000	14.300	13.000	17.000	14.000
NH3-N,MG/L	--	9.300	--	12.900	12.300	13.900	--	--	12.100	12.600	13.200	13.600	14.400	10.500
NO3-N,MG/L	--	0.300	--	0.400	0.200	0.500	--	--	0.500	0.100	0.700	0.200	0.400	0.900
PH	6.900	7.100	6.900	6.200	7.100	7.000	7.000	6.900	6.900	7.200	7.000	6.900	7.100	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	92.174	94.574	95.105	88.750	94.366	92.029	93.443	92.029	93.077	93.452	92.262	92.857	89.706	90.741
COD REMOVED,%	84.953	87.464	89.958	83.232	82.682	86.217	83.467	84.164	82.468	82.684	80.636	82.500	79.240	79.842
TSS REMOVED,%	92.969	95.902	94.828	75.397	93.860	92.500	88.406	86.667	93.182	93.671	85.714	90.667	82.317	81.579
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.513	0.594	0.653	0.674	0.627	0.630	0.576	0.557	0.461	0.820	0.692	0.563	0.520	0.438
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	94.096	112.201	117.560	128.958	119.482	116.116	107.605	116.383	105.113	138.004	146.663	126.107	109.702	82.176
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4770.848	4770.848	5247.938	5247.938	4770.848	3625.850	4484.598	5247.938	5725.020	5915.848	5247.938	5247.938	7156.277	5725.020
O2 SUPPLIED/BOD REMOVED,LB/LB	0.856	0.700	0.731	0.711	0.657	0.526	0.692	0.760	0.908	0.709	0.600	0.695	1.128	1.195
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3810.696	3898.355	3645.500	3883.641	3690.385	3733.434	3756.625	4015.791	4422.363	3328.801	4262.922	4554.992	4282.004	3819.845
VSS,MG/L	2938.741	3029.721	2884.189	3065.992	2956.310	2955.056	2994.116	3349.431	3656.772	2696.004	3399.324	3592.276	3378.656	3009.034
SVI,ML/GTSS	51.450	54.800	52.000	50.000	51.300	53.000	52.150	52.600	53.700	53.650	52.850	56.400	54.000	53.300
ZSV,FT/HR	8.405	8.495	9.205	8.960	7.630	9.085	10.750	8.030	7.270	7.905	6.905	5.745	6.760	7.565
TEMPERATURE,C **	15.000	15.000	15.000	16.000	16.000	16.000	16.000	16.000	16.000	17.000	17.000	16.000	16.000	15.000
DETENTION TIME,HR	1.830	1.722	1.821	1.858	1.780	1.780	1.698	1.775	1.852	1.823	1.715	1.829	1.856	1.968
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	585.326	622.197	588.091	576.569	601.918	601.918	630.954	603.301	578.413	587.631	624.501	585.767	577.030	544.307
SOLIDS LOAD,LB/FT2/DAY	20.249	21.865	19.452	20.364	21.189	20.334	21.334	21.916	23.254	17.750	23.989	24.221	22.469	19.043
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	775.925	865.079	560.066	816.764	833.444	837.595	735.087	630.074	816.763	840.100	1070.960	833.443	700.083	886.772
RETURN SLUDGE														
RECYCLE TSS,MG/L	17487.500	18325.000	17562.500	17400.000	18630.000	17567.500	19875.000	18050.000	23575.000	22200.000	20050.000	20387.500	20387.500	22700.000
RECYCLE RATIO,(EQ)	13.386	12.593	13.323	13.589	13.017	13.017	12.418	12.987	13.546	13.333	12.546	13.375	13.578	14.395

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	4/28/73	4/29/73	4/30/73	5/ 1/73	5/ 2/73	5/ 3/73	5/ 4/73	5/ 5/73	5/ 6/73	5/ 7/73	5/ 8/73	5/ 9/73	5/10/73	5/11/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	11.420	11.670	12.730	13.150	13.060	12.850	11.730	11.650	11.750	12.230	13.100	13.860	12.800	12.630
BOD5,MG/L	116.000	105.000	117.000	156.000	126.000	130.000	150.000	134.000	155.000	165.000	107.000	134.000	136.000	147.000
BOD5,SOL,MG/L	--	25.300	25.000	33.000	22.000	27.000	--	--	30.000	30.000	21.000	--	--	29.000
COD,MG/L	288.000	299.000	299.000	330.000	315.000	314.000	338.000	296.000	278.000	376.000	285.000	385.000	319.000	282.000
COD,SOL,MG/L	64.000	67.000	63.000	78.000	110.000	78.000	--	--	110.000	79.000	241.000	--	--	80.000
TSS,MG/L	142.000	98.000	128.000	152.000	122.000	130.000	156.000	154.000	132.000	178.000	124.000	136.000	140.000	148.000
VSS,MG/L	109.000	97.000	116.000	120.000	104.000	120.000	136.000	134.000	124.000	145.000	110.000	120.000	122.000	142.000
NH3-N,MG/L	--	11.100	11.500	10.300	13.900	12.500	--	--	14.700	15.500	15.100	11.900	--	--
NO3-N,MG/L	--	0.500	0.300	0.300	0.100	0.200	--	--	0.200	0.200	0.100	0.200	--	--
PH	7.400	7.300	7.300	7.300	7.200	7.200	7.200	7.200	7.000	7.300	7.300	7.300	7.300	7.100
EFFLUENT														
BOD5,MG/L	7.000	8.000	9.000	18.000	9.000	6.000	12.000	17.000	18.000	14.000	13.000	11.000	12.000	10.000
BOD5,SOL,MG/L	--	5.000	2.000	3.000	3.000	3.000	--	--	4.000	4.000	4.000	--	--	3.000
COD,MG/L	48.000	39.000	39.000	59.000	59.000	51.000	51.000	54.000	59.000	63.000	145.000	58.000	59.000	53.000
COD,SOL,MG/L	32.000	35.000	28.000	43.000	35.000	35.000	--	--	39.000	39.000	42.000	--	--	35.000
TSS,MG/L	15.000	13.000	13.000	12.000	14.000	8.000	15.000	20.000	16.000	9.000	14.000	13.000	13.000	6.000
VSS,MG/L	11.000	9.000	12.000	8.000	12.000	7.000	12.000	17.000	15.000	6.000	11.000	10.000	12.000	6.000
NH3-N,MG/L	--	10.100	11.100	14.700	12.200	13.100	--	--	13.000	13.300	13.900	12.000	--	--
NO3-N,MG/L	--	0.300	2.100	0.200	0.700	0.200	--	--	0.200	0.200	0.100	0.200	--	--
PH	7.000	7.100	7.200	7.200	7.000	7.000	6.800	6.900	6.900	7.000	7.000	7.100	7.300	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	93.965	92.381	92.308	93.590	92.857	95.385	92.000	87.313	88.387	91.515	87.850	91.791	91.176	93.197
COD REMOVED,%	83.333	86.957	86.957	82.121	81.270	83.758	84.911	81.757	84.392	83.245	75.214	84.935	81.505	81.206
TSS REMOVED,%	89.437	86.735	89.844	92.105	88.525	93.846	90.385	87.013	87.879	94.944	88.710	90.441	90.714	95.946
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.403	0.374	0.486	0.695	0.563	0.582	0.634	0.487	0.573	0.694	0.484	0.590	0.644	0.674
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	85.348	78.946	95.959	132.167	106.019	107.626	113.360	100.578	117.339	130.011	90.308	119.657	112.155	119.617
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5725.020	4770.848	5247.938	4475.000	6679.199	8110.398	6679.199	7516.199	7156.199	6202.098	5725.000	5725.000	5247.898	5247.898
O2 SUPPLIED/BOD REMOVED,LB/LB	1.111	1.015	0.919	0.561	1.053	1.226	0.994	1.333	1.074	0.809	1.120	0.806	0.794	0.728
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4380.402	4683.820	4067.191	3911.607	3655.394	3762.171	3644.370	4008.846	4031.893	3816.912	3810.743	4087.167	3486.952	3617.651
VSS,MG/L	3397.971	3386.565	3163.789	3048.770	2863.909	2964.759	2864.948	3309.931	3280.136	3002.476	2992.847	3252.136	2790.096	2844.868
SVI,ML/GTSS	57.950	53.400	55.850	55.450	53.350	53.900	56.300	54.950	56.100	49.250	55.550	47.150	49.800	44.150
ZSV,FT/HR	5.630	7.030	6.615	7.750	7.700	8.510	8.300	7.200	7.800	8.500	8.000	9.000	9.100	10.000
TEMPERATURE,C **	15.000	16.000	16.000	16.000	16.000	16.000	16.000	15.000	15.000	16.000	16.000	17.000	17.000	17.000
DETENTION TIME,HR	2.035	1.992	1.826	1.767	1.780	1.809	1.981	1.995	1.976	1.900	1.774	1.677	1.816	1.840
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	526.333	537.855	586.709	606.066	601.918	592.240	540.620	536.933	541.542	563.664	603.762	638.789	589.935	582.100
SOLIDS LOAD,LB/FT2/DAY	21.207	23.108	21.657	21.434	19.909	20.199	18.061	17.234	20.011	19.620	20.811	23.166	18.400	18.863
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	892.606	315.035	892.606	775.925	1108.466	1108.466	1219.113	694.249	630.076	886.771	1166.806	694.250	1050.125	991.786
RETURN SLUDGE														
RECYCLE TSS,MG/L	20100.000	23103.000	20562.500	20375.000	21787.500	21312.500	19887.500	18387.500	13137.500	23737.500	21925.000	23587.500	20825.000	21762.500
RECYCLE RATIO,(RQ)	14.886	14.567	13.354	12.928	13.017	13.230	14.493	--	14.468	13.400	12.977	10.823	11.719	11.876

** BASED ON RAW WASTEWATER FLOW ONLY

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APPENDIX A

DATE	5/12/73	5/13/73	5/14/73	5/15/73	5/16/73	5/17/73	5/18/73	5/19/73	5/20/73	5/21/73	5/22/73	5/23/73	5/24/73	5/25/73
INFLUENT WASTEWATER														
FLOW RATE(D),MGD	12.970	12.910	13.370	12.900	13.590	13.460	13.420	13.830	13.020	14.370	14.260	14.240	13.980	13.640
BOD5,MG/L	118.000	158.000	170.000	174.000	170.000	146.000	154.000	164.000	142.000	164.000	164.000	178.000	144.000	174.000
BOD5,SOL,MG/L	--	32.900	--	--	--	--	--	--	--	37.000	--	46.000	25.000	39.000
COD,MG/L	353.000	336.000	363.000	251.000	340.000	371.000	338.000	368.000	310.000	478.000	333.000	367.000	235.000	351.000
COD,SOL,MG/L	--	132.000	--	--	--	--	--	--	--	149.000	--	109.000	168.000	120.000
TSS,MG/L	140.000	128.000	154.000	144.000	146.000	152.000	160.000	176.000	142.000	172.000	150.000	192.000	130.000	134.000
VSS,MG/L	120.000	116.000	136.000	108.000	134.000	110.000	138.000	150.000	136.000	159.000	144.000	136.000	100.000	112.000
NH3-N,MG/L	--	17.800	16.600	17.800	--	16.700	--	--	--	17.100	--	--	14.800	15.200
NO3-N,MG/L	--	0.200	0.300	0.100	--	--	--	--	--	--	--	10.300	--	--
PH	7.300	7.100	7.100	7.200	7.200	7.200	7.200	7.300	7.200	7.200	7.100	--	7.200	7.100
EFFLUENT														
BOD5,MG/L	11.000	14.000	13.000	17.000	--	15.000	16.000	16.000	21.000	23.000	27.000	27.000	38.000	26.000
BOD5,SOL,MG/L	--	4.000	--	--	15.000	--	--	--	--	9.000	--	9.000	9.000	8.000
COD,MG/L	51.000	62.000	69.000	59.000	51.000	65.000	55.000	103.000	74.000	94.000	69.000	81.000	67.000	92.000
COD,SOL,MG/L	--	51.000	--	--	--	--	--	--	--	67.000	--	47.000	31.000	50.000
TSS,MG/L	15.000	13.000	5.000	19.000	20.000	24.000	22.000	15.000	22.000	20.000	26.000	27.000	17.000	19.000
VSS,MG/L	14.000	11.000	4.000	10.000	16.000	15.000	17.000	13.000	20.000	17.000	22.000	18.000	12.000	16.000
NH3-N,MG/L	--	13.900	14.400	16.700	--	13.600	--	--	--	14.300	--	5.000	14.300	15.100
NO3-N,MG/L	--	0.100	0.200	0.200	--	--	--	--	--	--	--	47.500	--	--
PH	7.000	6.900	7.100	7.200	7.000	7.100	7.000	7.000	7.100	6.900	7.000	--	7.000	6.800
TOTAL REMOVALS														
BOD5 REMOVED,%	90.678	91.139	92.353	90.230	100.000	89.726	89.610	90.244	85.211	85.976	83.537	84.831	73.611	85.057
COD REMOVED,%	85.552	81.548	80.992	76.494	85.000	82.480	83.728	72.011	76.129	80.335	79.279	77.929	71.489	73.789
TSS REMOVED,%	89.286	89.844	96.753	86.806	86.301	84.211	86.250	91.477	84.507	88.372	82.667	85.938	86.923	85.821
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.492	0.537	0.768	0.726	0.774	0.655	0.764	0.766	0.623	0.797	0.790	0.797	0.567	0.744
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	94.604	131.418	146.437	144.614	148.847	126.610	133.151	146.129	119.116	151.835	150.673	163.306	129.700	152.910
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HP	5247.898	5057.098	5725.000	5247.898	4770.797	6202.098	6202.098	4770.797	5725.000	5247.898	5725.000	6.950	5725.000	5725.000
O2 SUPPLIED/BOD REMOVED,LB/LB	0.908	0.653	0.657	0.622	0.526	0.844	0.804	0.559	0.872	0.622	0.701	0.001	0.924	0.681
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3969.543	4435.266	3796.187	3990.676	3939.030	3953.895	3564.547	3697.621	3758.848	3619.393	3934.075	4076.696	4627.691	4374.602
VSS,MG/L	3215.437	3921.499	3057.459	3190.642	3081.581	3098.950	2792.752	3057.839	3066.475	3053.059	3097.105	3282.470	3667.504	3295.434
SVI,ML/GTSS	49.850	46.750	65.050	54.150	53.250	52.400	49.150	49.750	48.000	38.750	42.850	7.000	39.950	40.000
DSV,FT/HR	8.720	7.200	7.800	7.900	7.600	7.900	9.600	9.700	10.000	12.700	9.600	--	10.900	9.600
TEMPERATURE,C **	17.000	17.000	16.000	17.000	--	17.000	17.000	17.000	17.000	17.000	18.000	18.000	18.000	17.000
DETENTION TIME,HR	1.792	1.800	1.738	1.802	1.710	1.727	1.732	1.680	1.785	1.617	1.630	1.632	1.662	1.704
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	597.770	595.005	616.205	594.544	626.345	620.354	618.510	637.406	600.074	662.294	657.224	656.303	644.320	628.650
SOLIDS LOAD,LB/FT2/DAY	21.195	23.584	20.830	21.205	21.934	21.827	19.625	20.917	20.140	21.196	22.679	23.678	26.434	24.440
SLUDGE WASTED														
*** SOLIDS WASTED,LB/HR	735.088	665.079	886.772	700.094	997.618	1108.467	997.620	840.349	665.079	933.444	886.772	554.232	758.423	791.761
RETURN SLUDGE														
RECYCLE TSS,MG/L	21164.000	22150.000	20100.000	20262.500	22775.000	20825.000	22275.000	21462.500	21237.500	22775.000	20425.000	17512.500	18450.000	21375.000
RECYCLE RATIO,(R)	11.565	11.619	11.219	11.622	11.036	11.144	11.177	10.846	11.521	10.438	10.519	10.534	10.730	10.997

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	5/26/73	5/27/73	5/28/73	5/29/73	5/30/73	5/31/73	6/ 1/73	6/ 2/73	6/ 3/73	6/ 4/73	6/ 5/73	6/ 6/73	6/ 7/73	6/ 8/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	13.420	14.140	14.160	14.160	13.580	13.590	13.230	13.080	12.650	11.950	11.760	11.590	11.570	12.020
BOD5,MG/L	174.000	149.000	103.000	132.000	137.000	179.000	166.000	190.000	172.000	168.000	196.000	208.000	166.000	184.000
BOD5,SOL,MG/L	42.000	--	24.000	23.000	24.000	31.000	--	--	--	--	44.000	42.000	27.000	--
COD,MG/L	365.000	267.000	300.000	300.000	283.000	391.000	327.000	388.000	365.000	362.000	441.000	438.000	332.000	346.000
COD,SOL,MG/L	87.000	--	159.000	116.000	94.000	109.000	--	--	--	--	126.000	102.000	79.000	--
TSS,MG/L	162.000	164.000	110.000	138.000	114.000	170.000	134.000	188.000	163.000	146.000	154.000	164.000	164.000	130.000
VSS,MG/L	140.000	152.000	82.000	106.000	98.000	142.000	128.000	164.000	142.000	130.000	145.000	156.000	143.000	124.000
NH3-N,MG/L	16.400	--	--	12.900	13.300	20.800	--	--	--	--	15.800	14.700	15.800	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.200	7.100	7.200	7.100	7.100	7.200	7.100	7.200	7.200	7.100	7.200	7.200	7.200	7.200
EFFLUENT														
BOD5,MG/L	21.000	17.000	16.000	16.000	14.000	15.000	16.000	17.000	15.000	16.000	17.000	20.000	12.000	13.000
BOD5,SOL,MG/L	7.000	--	6.000	5.000	5.000	7.000	--	--	--	--	8.000	6.000	5.000	--
COD,MG/L	75.000	65.000	70.000	85.000	75.000	82.000	76.000	66.000	67.000	87.000	94.000	98.000	75.000	83.000
COD,SOL,MG/L	58.000	--	60.000	55.000	39.000	51.000	--	--	--	--	79.000	51.000	51.000	--
TSS,MG/L	12.000	20.000	18.000	18.000	14.000	15.000	18.000	18.000	20.000	18.000	18.000	17.000	14.000	15.000
VSS,MG/L	10.000	19.000	15.000	13.000	13.000	10.000	16.000	18.000	19.000	16.000	17.000	16.000	14.000	13.000
NH3-N,MG/L	14.400	--	--	11.700	12.500	20.100	--	--	--	--	13.100	14.200	13.800	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.000	7.000	7.100	7.000	7.000	6.800	6.900	7.100	6.700	7.100	7.100	7.100	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	87.931	88.591	84.466	87.879	89.781	91.620	90.361	91.053	91.279	90.476	91.327	90.385	92.771	92.935
COD REMOVED,%	79.452	75.655	76.667	71.667	73.498	79.028	77.370	82.990	81.644	75.967	78.685	77.626	77.410	76.012
TSS REMOVED,%	92.593	87.805	83.636	86.957	87.719	91.176	86.567	90.426	87.730	87.671	88.312	89.634	91.463	88.462
BIOMASS LOADING														
BOD5/DAY/#LVSS	0.794	0.608	0.540	0.614	0.635	0.816	0.710	0.696	0.582	0.619	0.701	0.716	0.578	0.678
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	150.443	135.740	93.966	120.423	119.865	156.727	141.494	160.115	140.181	129.345	148.503	155.317	123.741	142.493
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5247.898	5247.898	4770.797	4770.797	5725.000	5247.898	5725.000	6202.098	5438.797	5725.000	7156.297	7156.297	5247.898	6202.098
O2 SUPPLIED/BOD REMOVED,LB/LB	0.616	0.672	0.926	0.695	0.820	0.563	0.690	0.656	0.655	0.754	0.813	0.783	0.702	0.719
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4341.500	4999.395	3667.746	4110.094	3983.434	3986.511	4143.125	4382.906	4590.844	4243.434	4291.980	4370.375	4340.895	4204.277
VSS,MG/L	3038.167	3578.083	2791.505	3145.986	3023.170	3079.605	3193.120	3685.387	3857.434	3349.035	3395.653	3478.982	3431.279	3369.198
SVI,ML/GTSS	46.150	43.000	42.200	42.500	41.500	41.450	42.100	44.300	47.400	44.900	46.100	46.200	46.300	46.500
ZSV,FT/HR	8.300	8.900	12.400	10.300	10.800	10.500	10.500	8.815	8.360	10.225	8.945	10.065	9.505	10.355
TEMPERATURE,C **	16.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	19.000	19.000	19.000
DETENTION TIME,HR	1.732	1.644	1.641	1.641	1.711	1.710	1.757	1.777	1.837	1.945	1.976	2.005	2.009	1.934
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	618.510	651.694	652.615	652.615	625.814	626.345	609.753	602.842	583.021	550.760	542.003	534.167	533.246	553.986
SOLIDS LOAD,LB/FT2/DAY	23.902	28.853	21.194	23.751	22.166	22.198	24.409	25.654	26.159	22.880	23.189	23.250	23.079	23.145
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	886.772	420.050	717.585	816.764	735.087	933.444	570.068	642.160	466.722	583.403	367.543	1283.486	816.763	840.100
RETURN SLUDGE														
RECYCLE TSS,MG/L	26900.000	23787.500	22412.500	21887.500	23925.000	16787.500	20125.000	22775.000	21225.000	22150.000	24412.500	22362.500	21412.500	20787.500
RECYCLE RATIO,(RQ)	11.177	10.638	10.593	10.593	11.046	11.038	20.680	21.269	22.071	22.276	24.507	24.392	24.529	24.118

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	6/ 9/73	6/10/73	6/11/73	6/12/73	6/13/73	6/14/73	6/15/73	6/16/73	6/17/73	6/18/73	6/19/73	6/20/73	6/21/73	6/22/73
INFLUENT WASTEWATER														
FLOW RATE(MG),MGD	11.530	11.880	11.820	11.920	11.660	11.570	11.410	11.120	11.010	11.050	11.610	12.050	12.860	8.650
BOD5,MG/L	154.000	166.000	226.000	136.000	166.000	176.000	188.000	165.000	210.000	160.000	156.000	217.000	104.000	142.000
BOD5,SOL,MG/L	--	34.000	38.000	28.000	34.000	37.000	--	--	45.000	--	--	--	--	29.000
COD,MG/L	375.000	279.000	460.000	236.000	329.000	335.000	365.000	331.000	405.000	441.000	362.000	388.000	262.000	309.000
COD,SOL,MG/L	--	101.000	79.000	79.000	157.000	126.000	--	--	140.000	--	--	--	--	77.000
TSS,MG/L	132.000	130.000	200.000	186.000	150.000	160.000	170.000	166.000	202.000	172.000	166.000	190.000	116.000	194.000
VSS,MG/L	116.000	88.000	158.000	126.000	138.000	130.000	146.000	144.000	190.000	156.000	144.000	168.000	104.000	150.000
NH3-N,MG/L	--	16.200	15.700	16.200	16.700	18.000	--	--	18.400	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.100	7.300	7.300	7.500	7.700	7.500	7.500	7.500	7.200	7.300	7.300	7.300	7.300	7.400
EFFLUENT														
BOD5,MG/L	13.000	19.000	14.000	11.000	12.000	19.000	17.000	19.000	14.000	11.000	12.000	12.000	34.000	9.000
BOD5,SOL,MG/L	--	5.000	4.000	5.000	4.000	7.000	--	--	5.000	--	--	--	--	4.000
COD,MG/L	66.000	78.000	67.000	71.000	67.000	22.000	63.000	59.000	70.000	83.000	63.000	66.000	108.000	54.000
COD,SOL,MG/L	--	39.000	44.000	47.000	27.000	18.000	--	--	58.000	--	--	--	--	31.000
TSS,MG/L	13.000	12.000	12.000	12.000	14.000	22.000	19.000	17.000	19.000	20.000	16.000	14.000	57.000	15.000
VSS,MG/L	12.000	8.000	10.000	9.000	12.000	18.000	17.000	16.000	19.000	18.000	14.000	14.000	38.000	10.000
NH3-N,MG/L	--	13.500	14.000	15.900	16.200	15.400	--	--	15.800	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.900	7.000	7.100	7.000	7.000	7.100	7.100	7.000	7.100	7.100	7.200	7.100	7.100	7.100
TOTAL REMOVALS														
BOD5 REMOVED,%	91.558	88.554	93.805	91.912	92.771	89.205	90.957	88.485	93.333	93.125	92.308	94.470	67.308	93.662
COD REMOVED,%	82.400	72.043	85.435	69.915	79.635	93.433	82.740	82.175	82.716	81.179	82.597	82.990	58.779	82.524
TSS REMOVED,%	90.152	90.769	94.000	93.548	90.667	86.250	88.824	89.759	90.594	88.372	90.361	92.632	50.862	92.268
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.481	0.491	0.773	0.385	0.489	0.658	0.666	0.570	0.678	0.538	0.636	0.929	0.459	0.308
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	114.399	127.056	172.107	104.445	124.703	131.195	138.202	118.212	148.963	113.908	116.688	168.468	86.168	79.136
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5725.000	6202.098	6202.098	6202.098	6488.297	5247.898	3816.699	5725.000	6583.797	5343.297	6202.098	6679.199	6679.199	5725.000
O2 SUPPLIED/BOD REMOVED,LB/LB	0.839	0.847	0.590	0.989	0.858	0.686	0.465	0.838	0.725	0.771	0.881	0.642	1.756	1.178
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4566.676	4809.223	4702.016	5551.461	5419.336	4008.652	4195.145	3983.024	4237.297	4218.020	3696.212	3624.683	3741.582	5229.070
VSS,MG/L	3815.524	4145.133	3570.324	4353.277	4090.658	3194.871	3328.347	3322.155	3524.042	3395.813	2939.685	2906.353	3007.699	4122.832
SVI,ML/GTSS	43.600	50.050	39.950	33.750	34.700	50.050	53.450	53.050	51.350	59.350	51.850	55.200	54.500	56.250
ZSV,FT/HR	8.270	8.290	8.785	8.940	8.845	9.440	8.720	8.355	7.995	6.795	9.315	7.890	9.090	5.635
TEMPERATURE,C **	19.000	19.000	19.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	21.000	21.000
DETENTION TIME,HR	2.016	1.956	1.966	1.950	1.993	2.009	2.037	2.090	2.111	2.103	2.002	1.929	1.807	2.687
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	531.402	547.533	544.768	549.377	537.394	533.246	525.872	512.506	507.436	509.280	535.089	555.368	592.700	398.667
SOLIDS LOAD,LB/FT2/DAY	22.242	23.952	24.308	29.056	27.807	20.366	21.165	19.520	20.724	20.567	18.691	18.839	20.573	20.687
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	958.446	857.603	816.765	886.773	735.068	980.116	900.108	966.770	816.764	583.402	735.068	816.764	664.454	933.445
RETURN SLUDGE														
RECYCLE TSS,MG/L	24225.000	22687.500	18987.500	21762.500	21675.000	20612.500	19850.000	20450.000	17687.500	19312.500	22162.500	20662.500	20350.000	22425.000
RECYCLE RATIO,(%)	14.475	13.611	16.528	18.993	19.254	18.997	19.825	19.433	20.381	19.701	18.036	16.888	15.894	23.942

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WFIP LOSSES)

APPENDIX A

DATE	6/23/73	6/24/73	6/25/73	6/26/73	6/27/73	6/28/73	6/29/73	6/30/73	7/ 1/73	7/ 2/73	7/ 3/73	7/ 4/73	7/ 5/73	7/ 6/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	11.670	11.030	11.740	11.000	11.130	11.920	12.220	11.750	10.960	11.120	11.680	8.310	9.610	10.580
BOD5,MG/L	170.000	172.000	172.000	144.000	158.000	164.000	158.000	128.000	144.000	158.000	146.000	166.000	176.000	156.000
BOD5,SOL,MG/L	29.000	--	36.000	36.000	39.000	--	--	--	--	--	45.000	32.000	34.000	33.000
COD,MG/L	253.000	366.000	439.000	348.000	269.000	204.000	346.000	346.000	450.000	299.000	328.000	266.000	363.000	435.000
COD,SOL,MG/L	142.000	--	133.000	142.000	111.000	--	--	--	--	--	109.000	135.000	132.000	113.000
TSS,MG/L	166.000	116.000	162.000	144.000	152.000	170.000	156.000	156.000	142.000	154.000	188.000	174.000	160.000	156.000
VSS,MG/L	146.000	86.000	106.000	114.000	132.000	140.000	142.000	128.000	110.000	132.000	134.000	138.000	152.000	132.000
NH3-N,MG/L	--	--	12.400	--	--	16.000	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.500	7.400	7.500	7.400	7.300	7.500	7.400	7.400	7.400	7.500	7.300	7.500	7.400	7.300
EFFLUENT														
BOD5,MG/L	9.000	10.000	12.000	11.000	11.000	11.000	14.000	9.000	16.000	13.000	13.000	12.000	10.000	9.000
BOD5,SOL,MG/L	5.000	--	3.000	4.000	4.000	--	--	--	--	--	3.000	4.000	4.000	4.000
COD,MG/L	43.000	63.000	51.000	79.000	55.000	59.000	83.000	63.000	89.000	59.000	63.000	61.000	52.000	60.000
COD,SOL,MG/L	28.000	--	39.000	36.000	43.000	--	--	--	--	--	47.000	43.000	41.000	32.000
TSS,MG/L	9.000	9.000	10.000	11.000	14.000	16.000	25.000	10.000	22.000	15.000	21.000	20.000	12.000	19.000
VSS,MG/L	6.000	7.000	3.000	7.000	12.000	11.000	22.000	9.000	19.000	10.000	16.000	14.000	11.000	15.000
NH3-N,MG/L	--	--	15.500	--	--	16.800	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.200	7.200	7.100	7.200	7.200	7.000	6.900	6.900	6.800	7.300	6.800	6.900	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	94.706	94.186	93.023	92.361	93.036	93.293	91.139	92.969	88.889	91.772	91.096	92.771	94.318	94.231
COD REMOVED,%	83.004	82.692	88.383	77.299	79.554	71.078	76.012	81.792	80.222	80.268	80.793	77.068	85.675	86.207
TSS REMOVED,%	94.578	92.241	93.827	92.361	90.789	90.588	83.974	93.590	84.507	90.260	88.830	88.506	92.500	87.821
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.623	0.554	0.664	0.550	0.601	0.739	0.672	0.490	0.415	0.490	0.356	0.429	0.521	0.665
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	127.818	122.229	130.097	102.053	113.298	125.948	124.394	96.899	101.682	113.197	109.867	88.875	108.970	106.336
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5725.000	5725.000	5725.000	6011.297	5725.000	8015.000	6392.898	6297.500	6297.500	6965.398	5725.000	5247.899	6011.199	5247.898
O2 SUPPLIED/BOD REMOVED,LB/LB	0.721	0.798	0.722	0.973	0.828	1.040	0.860	1.066	1.063	1.019	0.869	0.974	0.892	0.796
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4262.195	4445.660	3946.119	3849.868	3889.271	3454.940	3709.993	4014.231	5200.141	4691.344	4013.429	4308.836	4375.066	3268.555
VSS,MG/L	3286.506	3533.689	3138.739	2971.331	3021.423	2729.836	2880.036	3170.231	3931.370	3703.086	3168.568	3322.865	3353.346	2562.517
SVI,ML/GTSS	48.250	50.950	55.900	61.750	59.400	67.600	68.400	69.800	70.500	69.650	69.100	68.650	70.150	67.600
ZSV,FT/HR	7.990	6.180	7.790	7.640	7.380	8.540	7.270	6.180	3.880	5.460	6.650	5.700	5.820	9.070
TEMPERATURE,C **	21.000	21.000	21.000	21.000	21.000	21.000	21.000	21.000	21.000	22.000	22.000	21.000	21.000	22.000
DETENTION TIME,HR	1.992	2.107	1.980	2.113	2.068	1.950	1.902	1.978	2.121	2.090	1.990	2.797	2.418	2.197
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	537.855	508.358	541.081	506.975	512.967	549.377	563.203	541.542	505.132	512.506	538.315	382.997	442.912	487.618
SOLIDS LOAD,LB/FT2/DAY	21.547	21.377	20.015	18.471	18.831	17.797	19.588	20.511	24.924	23.066	20.292	15.898	18.548	15.005
SLUDGE WASTED ***														
SLUDGE WASTED,LB/HR	775.927	500.060	886.772	997.615	1030.159	997.619	720.086	826.765	840.100	816.764	975.115	1050.125	886.772	638.409
RETURN SLUDGE														
RECYCLE TSS,MG/L	18050.000	22112.500	21213.000	21025.000	19930.000	22850.000	17175.000	16575.000	18212.500	18412.500	19637.500	18387.500	17812.500	21337.500
RECYCLE RATIO,(R)	17.395	18.141	17.078	18.200	17.889	17.114	17.087	17.847	18.513	19.928	17.312	20.325	19.553	17.590

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	7/ 7/73	7/ 8/73	7/ 9/73	7/10/73	7/11/73	7/12/73	7/13/73	7/14/73	7/15/73	7/16/73	7/17/73	7/18/73	7/19/73	7/20/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.660	10.310	10.980	11.660	10.980	10.080	10.080	10.360	10.140	10.460	11.550	11.150	11.030	11.200
BOD5,MG/L	152.000	132.000	160.000	198.000	148.000	148.000	124.000	158.000	175.000	145.000	150.000	124.000	140.000	100.000
BOD5,SOL,MG/L	31.000	27.000	31.000	33.000	31.000	28.000	30.000	35.000	27.000	36.000	31.000	32.000	35.000	25.000
COD,MG/L	355.000	336.000	476.000	382.000	459.000	376.000	341.000	400.000	376.000	428.000	332.000	359.000	427.000	364.000
COD,SOL,MG/L	81.000	112.000	143.000	143.000	221.000	94.000	62.000	96.000	106.000	160.000	111.000	--	111.000	90.000
TSS,MG/L	176.000	130.000	152.000	186.000	240.000	144.000	126.000	180.000	178.000	184.000	184.000	146.000	180.000	100.000
VSS,MG/L	112.000	98.000	118.000	156.000	164.000	136.000	120.000	148.000	162.000	164.000	142.000	126.000	152.000	98.000
NH3-N,MG/L	--	--	--	16.000	--	--	--	--	--	--	14.000	14.300	16.500	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.500	7.400	7.400	7.300	7.400	7.400	7.400	7.400	7.400	7.400	7.300	7.300	7.300	7.400
EFFLUENT														
BOD5,MG/L	10.000	11.000	12.000	13.000	11.000	13.000	12.000	10.000	13.000	16.000	14.000	3.000	7.000	7.000
BOD5,SOL,MG/L	3.000	5.000	3.000	4.000	4.000	4.000	4.000	3.000	3.000	3.000	5.000	5.000	8.000	4.000
COD,MG/L	52.000	72.000	87.000	81.000	103.000	86.000	70.000	68.000	46.000	78.000	75.000	80.000	63.000	56.000
COD,SOL,MG/L	28.000	44.000	56.000	28.000	47.000	47.000	31.000	44.000	32.000	38.000	43.000	52.000	47.000	27.000
TSS,MG/L	8.000	17.000	8.000	16.000	17.000	25.000	17.000	17.000	20.000	33.000	25.000	26.000	11.000	8.000
VSS,MG/L	6.000	11.000	6.000	13.000	15.000	24.000	16.000	16.000	14.000	29.000	19.000	24.000	9.000	6.000
NH3-N,MG/L	--	--	--	16.500	--	--	--	--	--	--	14.000	13.700	13.400	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	6.800	7.000	7.000	7.000	7.100	6.900	6.900	6.900	7.000	6.900	7.000	7.000	7.200	7.200
TOTAL REMOVALS														
BOD5 REMOVED,%	93.421	91.667	92.500	93.434	92.568	91.216	91.045	93.671	92.571	88.965	90.667	97.581	95.000	93.000
COD REMOVED,%	85.352	78.571	81.723	78.796	77.560	77.128	79.472	83.000	87.766	81.776	77.410	77.716	85.246	84.615
TSS REMOVED,%	95.455	86.923	94.737	91.398	92.917	82.639	86.508	90.556	88.764	82.065	86.413	82.192	93.889	92.000
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.605	0.480	0.633	0.923	0.536	0.556	0.515	0.659	0.651	0.582	0.628	0.462	0.508	0.378
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	104.393	87.681	113.186	148.742	104.697	96.115	87.023	105.460	114.327	97.717	111.621	89.077	99.489	72.159
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5247.898	5725.000	4770.797	5725.000	5247.898	4770.797	5247.898	5247.898	4580.000	5725.000	5725.000	5629.598	5725.000	6965.398
O2 SUPPLIED/BOD REMOVED,LB/LB	0.818	1.083	0.690	0.626	0.823	0.830	1.010	0.808	0.658	1.001	0.860	0.981	0.918	1.572
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3618.968	3818.407	3690.393	3454.031	4196.462	3861.350	3596.951	3407.575	3732.909	3487.026	3763.254	4095.041	4111.699	3975.158
VSS,MG/L	2767.600	2924.946	2866.691	2582.202	3129.482	2771.107	2707.854	2563.256	2816.414	2690.780	2850.177	3092.829	3139.443	3060.996
SVI,ML/GTSS	68.300	70.750	71.650	68.900	71.600	65.950	70.950	63.650	70.200	68.250	63.850	61.600	63.650	49.450
ZSV,FT/HR	7.820	6.540	7.000	8.630	6.503	8.470	8.100	9.450	6.320	8.630	6.290	6.970	7.120	9.480
TEMPERATURE,C **	22.000	22.000	23.000	22.000	22.000	21.000	21.000	22.000	22.000	22.000	22.000	23.000	23.000	23.000
DETENTION TIME,HR	2.180	2.254	2.117	1.993	2.117	2.306	2.306	2.243	2.292	2.222	2.012	2.084	2.107	2.075
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	491.305	475.174	506.053	537.394	506.053	464.573	464.573	477.478	467.339	482.067	532.324	513.888	508.358	516.193
SOLIDS LOAD,LB/FT2/DAY	16.675	17.136	17.036	16.437	19.933	15.302	15.690	15.083	16.067	15.343	18.165	19.535	18.967	18.472
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	857.602	945.113	775.926	775.926	1219.312	1050.125	438.803	1050.125	816.764	933.444	1166.805	886.771	816.763	886.773
RETURN SLUDGE														
RECYCLE TSS,MG/L	18412.500	21787.500	16125.000	15475.000	16687.500	18150.000	20400.000	18087.500	22525.000	17563.000	17988.000	20690.000	21600.000	17988.000
RECYCLE RATIO,(R/Q)	17.139	17.963	13.953	10.600	17.231	12.361	17.272	15.782	15.930	13.996	13.255	15.946	13.336	12.437

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	7/21/73	7/22/73	7/23/73	7/24/73	7/25/73	7/26/73	7/27/73	7/28/73	7/29/73	7/30/73	7/31/73	8/ 1/73	8/ 2/73	8/ 3/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	12.000	9.800	10.960	10.770	10.670	10.720	12.150	10.340	10.410	11.030	11.050	11.320	10.260	10.800
BOD5,MG/L	146.000	134.000	216.000	133.000	188.000	140.000	150.000	156.000	154.000	174.000	150.000	132.000	146.000	128.000
BOD5,SOL,MG/L	28.000	27.000	31.000	22.000	35.000	25.000	28.000	29.000	36.000	36.000	34.000	37.000	32.000	30.000
COD,MG/L	314.000	395.000	400.000	366.000	439.000	359.000	346.000	409.000	319.000	413.000	400.000	381.000	379.000	328.000
COD,SOL,MG/L	111.000	--	99.000	113.000	78.000	94.000	71.000	78.000	161.000	106.000	100.000	111.000	111.000	63.000
TSS,MG/L	170.000	154.000	228.000	144.000	152.000	156.000	140.000	146.000	148.000	168.000	164.000	162.000	148.000	152.000
VSS,MG/L	130.000	114.000	192.000	120.000	136.000	134.000	128.000	142.000	134.000	158.000	156.000	146.000	124.000	120.000
NH3-N,MG/L	--	13.400	--	--	16.000	15.500	--	--	14.000	17.400	14.500	17.100	15.800	15.500
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.400	7.300	7.400	7.500	7.400	7.600	7.400	7.500	7.500	7.500	7.300	7.400	7.300	7.300
EFFLUENT														
BOD5,MG/L	10.000	9.000	7.000	9.000	8.000	8.000	10.000	9.000	38.000	12.000	14.000	16.000	14.000	13.000
BOD5,SOL,MG/L	3.000	2.000	2.000	2.000	2.000	2.000	3.000	3.000	3.000	3.000	5.000	6.000	6.000	4.000
COD,MG/L	79.000	52.000	38.000	34.000	55.000	59.000	63.000	51.000	196.000	62.000	28.000	79.000	79.000	59.000
COD,SOL,MG/L	40.000	31.000	19.000	21.000	51.000	27.000	47.000	47.000	86.000	38.000	27.000	48.000	51.000	39.000
TSS,MG/L	18.000	18.000	13.000	15.000	9.000	12.000	11.000	7.000	23.000	21.000	28.000	28.000	26.000	18.000
VSS,MG/L	12.000	13.000	11.000	13.000	6.000	11.000	11.000	7.000	21.000	20.000	27.000	23.000	17.000	14.000
NH3-N,MG/L	--	11.200	--	--	13.400	16.100	--	--	15.500	14.600	12.700	14.000	13.500	17.000
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.200	7.200	7.000	7.200	7.200	7.100	7.200	6.800	7.000	7.200	7.000	7.200	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	93.151	93.284	96.759	93.233	95.238	94.286	93.333	94.231	75.325	93.103	90.667	87.879	90.411	89.844
COD REMOVED,%	74.841	85.352	90.500	90.710	87.472	83.565	81.792	87.500	38.558	84.988	93.000	79.265	79.156	82.012
TSS REMOVED,%	89.412	88.312	94.298	89.583	94.079	92.308	92.143	95.205	84.459	87.500	82.927	82.716	82.432	88.158
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.542	0.384	0.850	0.509	0.600	0.509	0.685	0.571	0.575	0.760	0.689	0.616	0.597	0.559
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	112.877	84.606	152.523	92.287	114.408	96.693	117.419	103.924	105.271	123.651	106.789	96.270	96.510	89.065
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	5725.000	5725.000	5247.898	5247.898	6202.098	4770.797	5247.898	5247.898	5725.000	4866.199	4293.699	6202.098	4770.797	4293.797
O2 SUPPLIED/BOD REMOVED,LB/LB	0.825	1.099	0.541	0.924	0.862	0.790	0.723	0.806	1.090	0.640	0.670	1.111	0.828	0.813
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4329.559	4678.465	3729.104	3757.737	3967.490	3902.553	3595.608	3746.203	3774.438	3311.181	3171.458	3160.711	3301.931	3223.756
VSS,MG/L	3339.661	3534.387	2876.722	2903.534	3055.456	3046.861	2748.960	2919.396	2935.785	2606.090	2484.176	2505.952	2591.805	2554.964
SVI,ML/GTSS	65.400	56.150	57.850	60.250	63.000	88.500	65.200	75.850	74.300	80.450	82.150	82.050	72.600	75.150
ZSV,FT/HR	6.040	7.200	10.100	8.950	7.650	5.080	8.680	7.190	6.990	6.510	7.230	7.450	8.300	7.800
TEMPERATURE,C **	23.000	23.000	22.000	23.000	23.000	24.000	24.000	25.000	24.000	24.000	24.000	23.000	23.000	23.000
DETENTION TIME,HR	1.937	2.372	2.121	2.158	2.199	2.168	1.913	2.248	2.191	2.107	2.103	2.053	2.265	2.152
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	553.064	451.669	565.132	496.375	487.157	494.070	559.977	476.557	489.003	508.358	509.280	521.724	472.870	497.758
SOLIDS LOAD,LB/FT2/DAY	21.635	18.572	16.114	15.905	17.978	16.159	17.860	16.528	17.006	15.432	14.804	15.419	17.181	17.273
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	886.772	700.083	997.619	694.452	1155.136	840.101	840.100	840.097	997.619	886.773	735.087	1050.126	840.101	840.100
RETURN SLUDGE														
RECYCLE TSS,MG/L	23736.000	22400.000	19650.000	21150.000	23775.000	21388.000	16613.000	18288.000	17063.000	17200.000	18325.000	16825.000	16825.000	15750.000
RECYCLE RATIO,(R)	12.850	9.776	6.943	6.503	16.178	4.674	10.790	15.629	15.080	14.506	14.480	16.784	37.437	34.444

** BASED ON FLOW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	8/ 4/73	8/ 5/73	8/ 6/73	8/ 7/73	8/ 8/73	8/ 9/73	8/10/73	8/11/73	8/12/73	8/13/73	8/14/73	8/15/73	8/16/73	8/17/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.800	10.400	11.500	11.500	12.100	11.280	11.370	11.430	10.650	11.040	11.030	11.350	11.990	10.600
BOD5,MG/L	142.000	155.000	168.000	192.000	158.000	158.000	148.000	160.000	164.000	156.000	132.000	140.000	152.000	118.000
BOD5,SOL.,MG/L	27.000	35.000	42.000	45.000	42.000	43.000	33.000	42.000	46.000	40.000	35.000	40.000	9.000	29.000
COD,MG/L	372.000	362.000	422.000	423.000	354.000	414.000	443.000	457.000	409.000	425.000	371.000	357.000	371.000	332.000
COD,SOL.,MG/L	124.000	79.000	109.000	165.000	92.000	112.000	174.000	157.000	126.000	157.000	176.000	174.000	168.000	158.000
TSS,MG/L	188.000	134.000	184.000	186.000	192.000	184.000	172.000	228.000	184.000	168.000	144.000	152.000	160.000	206.000
VSS,MG/L	132.000	104.000	158.000	152.000	162.000	146.000	150.000	192.000	156.000	156.000	146.000	134.000	138.000	130.000
NH3-N,MG/L	15.900	15.300	14.500	29.600	15.000	13.700	--	--	19.900	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.400	7.400	7.300	7.300	7.500	7.300	7.400	7.300	7.200	7.200	7.300	7.500	7.600	7.400
EFFLUENT														
BOD5,MG/L	12.000	11.000	11.000	15.000	13.000	14.000	13.000	13.000	11.000	11.000	14.000	13.000	18.000	15.000
BOD5,SOL.,MG/L	4.000	2.000	3.000	3.000	4.000	8.000	3.000	4.000	4.000	3.000	4.000	4.000	6.000	5.000
COD,MG/L	62.000	59.000	63.000	66.000	62.000	68.000	79.000	79.000	20.000	79.000	32.000	48.000	71.000	63.000
COD,SOL.,MG/L	31.000	31.000	43.000	35.000	46.000	48.000	55.000	55.000	47.000	51.000	18.000	24.000	34.000	55.000
TSS,MG/L	16.000	8.000	12.000	19.000	26.000	24.000	15.000	24.000	14.000	15.000	17.000	20.000	25.000	24.000
VSS,MG/L	12.000	6.000	6.000	15.000	21.000	22.000	14.000	22.000	11.000	13.000	10.000	16.000	23.000	15.000
NH3-N,MG/L	15.100	9.100	13.200	15.900	14.300	14.100	--	--	15.300	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.300	7.200	7.200	7.000	7.700	7.000	7.000	7.100	7.200	7.100	7.000	7.000	6.900
TOTAL REMOVALS														
BOD5 REMOVED,%	91.549	92.903	93.452	92.188	91.772	91.139	91.216	91.875	93.293	92.949	89.394	91.875	88.158	87.288
COD REMOVED,%	83.333	83.702	85.071	84.397	82.486	83.575	82.167	82.713	95.110	81.412	91.375	86.555	80.863	81.024
TSS REMOVED,%	91.489	94.030	93.478	89.785	86.458	86.957	91.279	89.474	92.391	91.071	89.634	86.842	84.375	88.350
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.601	0.616	0.727	0.890	0.790	0.658	0.680	0.739	0.745	0.684	0.538	0.613	0.584	0.392
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	98.806	103.857	124.474	142.256	123.173	114.825	108.416	117.825	112.529	110.960	93.804	117.000	117.418	80.586
VARIOUS PROCESS DATA														
O2 SUPPLIED,FT3/HR	5725.000	4770.797	5247.898	5725.000	5247.898	5247.898	5247.898	5725.000	4484.598	5725.000	5247.898	5725.000	5247.898	5247.898
O2 SUPPLIED/BOD REMOVED,LB/LB	0.959	0.749	0.683	0.659	0.703	0.757	0.804	0.801	0.647	0.838	0.965	0.804	0.765	1.126
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3395.131	3486.220	3670.138	3390.896	3160.473	3530.635	3211.352	3252.726	3374.115	3589.762	3582.056	3900.557	4142.805	4231.211
VSS,MG/L	2636.679	2701.644	2742.637	2562.517	2498.228	2797.338	2556.510	2554.152	2421.383	2598.837	2796.140	3059.973	3220.872	3290.961
SVI,ML/GTSS	70.450	69.050	64.650	67.250	76.500	75.650	76.100	78.150	71.950	71.850	67.500	64.050	65.450	64.800
ZSV,FT/HR	7.800	7.100	8.000	7.700	8.000	6.600	7.900	6.900	7.400	7.300	6.000	6.900	6.600	5.800
TEMPERATURE,C **	23.000	23.000	23.000	24.000	23.000	24.000	23.000	23.000	23.000	24.000	24.000	24.000	24.000	24.000
DETENTION TIME,HR	2.152	2.235	2.021	2.021	1.921	2.060	2.044	2.033	2.182	2.105	2.107	2.048	1.938	2.193
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	497.758	479.322	530.020	530.020	557.673	519.880	524.028	526.793	490.844	508.819	508.358	523.106	552.603	488.540
SOLIDS LOAD,LB/FT2/DAY	18.047	17.457	19.567	19.073	18.485	19.581	17.873	18.222	17.855	19.687	19.552	21.249	21.035	19.281
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	1166.807	793.428	816.765	857.603	857.602	980.117	980.117	495.892	630.075	420.050	1050.126	1166.806	1283.486	1100.465
RETURN SLUDGE														
RECYCLE TSS,MG/L	15812.500	16337.500	17837.500	16062.500	15987.500	14912.500	17737.500	14700.000	17162.500	18750.000	19212.500	17962.500	19425.000	22200.000
RECYCLE RATIO,(RQ)	33.380	30.481	32.878	32.548	30.992	33.245	32.656	32.826	34.657	34.620	34.107	30.070	14.762	16.500

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	8/18/73	8/19/73	8/20/73	8/21/73	8/22/73	8/23/73	8/24/73	8/25/73	8/26/73	8/27/73	8/28/73	8/29/73	8/30/73	8/31/73
INFLUENT WASTEWATER														
FLOW RATE(S),MGD	10.640	10.690	11.010	13.100	9.800	10.540	10.820	10.250	10.850	10.660	10.280	10.470	11.800	12.000
BOD5,MG/L	133.000	125.000	210.000	79.000	122.000	126.000	148.000	150.000	146.000	140.000	182.000	144.000	153.000	138.000
BOD5,SOL,MG/L	33.000	29.000	29.000	19.000	28.000	29.000	33.000	29.000	33.000	32.000	39.000	34.000	36.000	30.000
COD,MG/L	368.000	304.000	376.000	188.000	311.000	286.000	362.000	375.000	358.000	468.000	406.000	237.000	379.000	408.000
COD,SOL,MG/L	144.000	160.000	168.000	94.000	109.000	103.000	103.000	86.000	104.000	255.000	246.000	104.000	190.000	125.000
TSS,MG/L	164.000	128.000	196.000	96.000	142.000	128.000	148.000	150.000	164.000	168.000	158.000	140.000	166.000	144.000
VSS,MG/L	128.000	112.000	168.000	76.000	104.000	98.000	142.000	148.000	138.000	126.000	138.000	132.000	148.000	134.000
NH3-N,MG/L	--	--	--	12.400	13.700	15.100	--	--	14.600	13.000	13.700	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.200	7.400	7.500	7.300	7.500	7.500	7.400	7.400	7.200	7.500	7.400	7.500	7.300	7.300
EFFLUENT														
BOD5,MG/L	12.000	11.000	13.000	15.000	8.000	17.000	9.000	8.000	8.000	6.000	11.000	15.000	7.000	9.000
BOD5,SOL,MG/L	6.000	3.000	3.000	5.000	3.000	5.000	3.000	4.000	4.000	2.000	6.000	6.000	3.000	3.000
COD,MG/L	76.000	61.000	48.000	63.000	51.000	83.000	67.000	66.000	74.000	53.000	56.000	44.000	51.000	67.000
COD,SOL,MG/L	60.000	36.000	32.000	23.000	39.000	40.000	39.000	47.000	54.000	29.000	31.000	24.000	28.000	59.000
TSS,MG/L	19.000	18.000	20.000	14.000	15.000	28.000	16.000	17.000	15.000	12.000	14.000	17.000	16.000	11.000
VSS,MG/L	15.000	15.000	17.000	11.000	12.000	22.000	16.000	17.000	12.000	10.000	13.000	16.000	15.000	10.000
NH3-N,MG/L	--	--	--	9.400	11.000	18.300	--	--	10.800	10.500	11.600	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.000	7.100	7.200	7.100	7.100	7.100	7.200	7.000	7.000	7.100	7.200	7.200	7.300	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	90.977	91.200	93.810	81.013	93.443	86.508	93.919	94.667	94.521	95.714	93.956	89.583	95.425	93.478
COD REMOVED,%	79.348	79.934	87.302	66.489	83.601	70.979	81.492	82.400	79.330	88.675	86.699	81.435	86.544	83.578
TSS REMOVED,%	88.415	85.938	89.796	85.417	89.437	78.125	89.189	88.667	90.854	92.857	91.139	87.857	90.361	92.361
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.436	0.403	0.722	0.384	0.316	0.392	0.578	0.466	0.495	0.374	0.665	0.549	0.662	0.617
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	91.173	86.091	148.963	66.676	77.029	85.562	103.172	100.024	102.060	96.152	120.541	97.136	116.317	100.692
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	6679.199	4293.797	4293.797	7156.297	7033.297	4770.797	5725.000	5725.000	6679.199	5725.000	5725.000	5725.000	6202.098	5247.898
O2 SUPPLIED/BOD REMOVED,LB/LB	1.216	0.826	0.464	2.000	1.601	0.973	0.892	0.913	1.065	0.939	0.761	0.993	0.918	0.794
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	4458.004	4363.531	4207.473	3636.946	3169.980	4535.773	3763.342	4492.051	4294.383	5404.215	3784.317	3659.106	3642.407	3568.974
VSS,MG/L	3348.130	3427.698	3365.625	2782.471	2419.767	3501.060	2861.102	3442.477	3303.149	4124.578	2906.612	2637.998	2816.691	2772.212
SVI,ML/GTSS	62.250	66.750	63.750	68.500	66.750	39.850	68.600	73.650	69.650	60.300	70.200	71.650	69.550	72.350
ZSV,FT/HR	6.800	5.100	5.800	6.100	5.500	4.200	6.000	4.600	5.100	5.500	6.000	6.600	7.400	6.500
TEMPERATURE,C **	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000	25.000	24.000	--	24.000
DETENTION TIME,HR	2.184	2.174	2.111	1.774	2.372	2.205	2.148	2.246	2.142	2.160	2.261	2.220	1.970	1.937
FINAL SETTLE														
OVERFLOW,GAL/FT2/DAY	490.384	492.688	517.436	633.762	551.669	485.774	498.679	477.018	500.062	491.305	473.792	482.548	543.846	553.064
SOLIDS LOAD,LB/FT2/DAY	20.354	20.836	19.802	23.064	22.237	20.839	17.761	20.347	20.090	24.967	16.735	16.366	18.145	17.916
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	1166.805	1700.203	776.567	816.765	1106.464	1108.466	775.926	816.764	1166.806	735.088	554.234	1483.487	840.101	997.619
RETURN SLUDGE														
RECYCLE TSS,MG/L	23250.000	22175.000	19762.500	22612.500	22412.500	16550.000	19812.500	18925.000	18162.500	17937.500	17825.000	17912.500	19325.000	15575.000
RECYCLE RATIO,(RQ)	16.288	15.744	15.840	14.122	18.939	18.131	18.207	18.599	16.848	17.448	16.576	15.769	14.407	13.367

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	9/ 1/73	9/ 2/73	9/ 3/73	9/ 4/73	9/ 5/73	9/ 6/73	9/ 7/73	9/ 8/73	9/ 9/73	9/10/73	9/11/73	9/12/73	9/13/73	9/14/73
INFLUENT WASTEWATER														
FLOW RATE(C),MGD	12.000	11.400	11.650	10.210	11.300	11.010	10.500	10.620	10.620	10.510	11.200	11.300	11.750	11.430
BOD5,MG/L	150.000	160.000	130.000	150.000	148.000	148.000	156.000	170.000	194.000	174.000	160.000	150.000	157.000	100.000
BOD5,SOL,MG/L	34.000	25.000	47.000	41.000	41.000	40.000	30.000	49.000	52.000	40.000	35.000	43.000	35.000	21.000
COD,MG/L	401.000	369.000	275.000	382.000	319.000	255.000	362.000	389.000	418.000	400.000	372.000	367.000	478.000	288.000
COD,SOL,MG/L	124.000	154.000	46.000	70.000	80.000	80.000	94.000	109.000	--	112.000	81.000	112.000	143.000	64.000
TSS,MG/L	178.000	154.000	112.000	154.000	178.000	156.000	160.000	172.000	168.000	146.000	130.000	128.000	168.000	138.000
VSS,MG/L	154.000	144.000	104.000	132.000	160.000	128.000	128.000	148.000	156.000	134.000	122.000	122.000	154.000	122.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	17.900	19.300	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.300	7.300	7.400	7.400	7.300	7.300	7.300	7.300	7.200	7.900	7.500	7.400	7.300	7.400
EFFLUENT														
BOD5,MG/L	10.000	9.000	9.000	11.000	16.000	10.000	13.000	13.000	15.000	16.000	15.000	10.000	25.000	17.000
BOD5,SOL,MG/L	3.000	2.000	2.000	3.000	4.000	5.000	3.000	4.000	4.000	3.000	9.000	8.000	5.000	4.000
COD,MG/L	77.000	65.000	57.000	57.000	68.000	44.000	63.000	66.000	63.000	64.000	65.000	60.000	112.000	92.000
COD,SOL,MG/L	39.000	46.000	27.000	46.000	28.000	--	35.000	31.000	35.000	48.000	49.000	40.000	60.000	60.000
TSS,MG/L	20.000	17.000	19.000	16.000	34.000	17.000	18.000	18.000	17.000	21.000	27.000	8.000	37.000	26.000
VSS,MG/L	18.000	16.000	17.000	13.000	29.000	12.000	13.000	14.000	17.000	19.000	25.000	7.000	36.000	22.000
NH3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	18.500	17.400	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.100	7.000	7.000	7.100	7.100	7.100	7.100	6.900	7.200	7.000	7.000	7.100	7.100	7.000
TOTAL REMOVALS														
BOD5 REMOVED,%	93.333	94.375	93.077	92.667	89.189	93.243	91.558	92.353	92.268	90.805	90.625	93.333	84.076	83.000
COD REMOVED,%	80.798	82.385	79.273	85.079	78.683	82.745	82.597	83.033	84.928	84.000	82.527	83.651	76.569	68.056
TSS REMOVED,%	88.764	88.961	83.036	89.873	80.899	89.103	88.750	89.535	89.881	85.616	79.231	93.750	77.976	82.667
BIOMASS LOADING														
BOD5/DAY/MLVSS	0.653	0.641	0.500	0.587	0.673	0.678	0.644	0.679	0.709	0.712	0.661	0.673	0.781	0.474
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	115.970	117.516	97.575	98.671	107.749	104.983	104.179	116.317	132.739	117.821	115.454	109.205	118.853	78.641
VAPCR PHASE DATA														
02 SUPPLIED,FT3/HR	5247.898	5725.000	6488.699	5534.199	6202.098	5915.797	6679.199	5725.000	5725.000	5725.000	7633.297	5725.000	5247.898	6202.898
02 SUPPLIED/BOD REMOVED,LB/LB	0.727	0.779	1.079	0.914	0.971	0.912	1.054	0.805	0.706	0.805	1.098	0.848	0.793	1.532
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3644.954	3829.193	4029.824	3493.050	3271.691	3175.207	3340.567	3570.540	3866.731	3386.515	3602.702	3348.547	3099.575	3161.877
VSS,MG/L	2844.501	2940.181	3125.500	2696.173	2564.344	2480.014	2594.225	2746.888	3001.009	2650.783	2800.911	2630.519	2439.630	2492.445
SVI,ML/GTSS	79.650	77.350	80.900	81.450	85.900	84.150	92.400	80.450	85.700	90.500	85.700	82.850	78.250	78.900
ISV,FT/HR	6.150	5.780	5.300	6.150	6.150	7.710	5.610	5.420	4.400	5.060	5.420	6.150	8.310	7.820
TEMPERATURE,C **	24.000	24.000	24.000	24.000	25.000	24.000	25.000	24.000	24.000	25.000	25.000	24.000	24.000	24.000
DETENTION TIME,HR	1.937	2.039	1.995	2.276	2.057	2.111	2.213	2.188	2.188	2.211	2.075	2.057	1.978	2.033
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	553.064	525.411	536.933	470.565	520.802	507.436	483.931	489.462	489.462	484.392	516.193	520.802	541.542	526.793
SOLIDS LOAD,LB/FT2/DAY	18.334	19.003	20.060	15.940	16.164	15.325	15.327	16.656	18.092	15.659	17.559	16.244	15.358	15.226
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	991.786	997.619	840.100	1050.126	1419.313	702.731	500.059	500.059	750.923	735.088	630.075	443.386	771.759	420.050
RETURN SLUDGE														
RECYCLE TSS,MG/L	16650.000	18295.000	16063.000	18363.000	16800.000	16538.000	16613.000	14650.000	14525.000	15525.000	16030.000	15813.000	16338.000	18875.000
RECYCLE RATIO,(EQ)	13.592	17.974	15.794	21.126	18.487	18.801	18.419	19.040	19.397	19.229	17.929	16.336	14.281	14.173

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	9/15/73	9/16/73	9/17/73	9/18/73	9/19/73	9/20/73	9/21/73	9/22/73	9/23/73	9/24/73	9/25/73	9/26/73	9/27/73	9/28/73
INFLUENT WASTEWATER														
FLOW RATE(Q),MGD	10.810	12.040	12.650	11.700	12.180	12.280	12.110	12.590	12.330	11.960	11.710	12.100	11.130	10.850
BOD5,MG/L	110.000	139.000	147.000	150.000	156.000	162.000	170.000	148.000	109.000	153.000	115.000	173.000	165.000	215.000
BOD5,SOL,MG/L	36.000	26.000	40.000	34.000	49.000	26.000	40.000	38.000	25.000	35.000	26.000	46.000	42.000	65.000
COD,MG/L	303.000	316.000	395.000	397.000	395.000	362.000	486.000	436.000	327.000	414.000	317.000	455.000	402.000	506.000
COD,SOL,MG/L	72.000	32.000	87.000	143.000	158.000	94.000	110.000	86.000	70.000	104.000	87.000	141.000	112.000	126.000
TSS,MG/L	124.000	124.000	174.000	146.000	164.000	178.000	184.000	274.000	139.000	178.000	162.000	208.000	216.000	260.300
VSS,MG/L	106.000	108.000	124.000	104.000	120.000	136.000	150.000	202.000	118.000	148.000	136.000	172.000	174.000	208.000
NH3-N,MG/L	--	--	--	--	20.400	18.200	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.300	7.400	7.400	7.400	7.300	7.500	7.300	7.400	7.300	7.400	7.300	7.400	7.400	7.400
EFFLUENT														
BOD5,MG/L	18.000	12.000	11.000	22.000	13.000	15.000	15.000	16.000	14.000	22.000	15.000	15.000	13.000	14.000
BOD5,SOL,MG/L	6.000	2.000	8.000	6.000	4.000	4.000	4.000	3.000	4.000	4.000	4.000	4.000	8.000	4.000
COD,MG/L	84.000	63.000	75.000	83.000	67.000	75.000	71.000	66.000	66.000	88.000	71.000	71.000	72.000	79.000
COD,SOL,MG/L	44.000	28.000	47.000	63.000	43.000	43.000	43.000	43.000	39.000	44.000	56.000	51.000	48.000	51.000
TSS,MG/L	43.000	19.000	10.000	31.000	26.000	25.000	25.000	25.000	30.000	25.000	36.000	31.000	24.000	25.000
VSS,MG/L	38.000	12.000	2.000	22.000	20.000	18.000	21.000	20.000	21.000	21.000	31.000	23.300	19.000	17.000
NH3-N,MG/L	--	--	--	--	16.300	14.100	--	--	--	--	--	--	--	--
NO3-N,MG/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PH	7.100	7.100	7.000	7.100	7.200	7.200	7.100	7.200	7.200	7.200	7.100	7.200	7.200	7.100
TOTAL REMOVALS														
BOD5 REMOVED,%	83.636	91.367	92.517	85.333	91.667	90.741	91.176	91.489	87.156	85.621	86.957	91.329	92.121	93.488
COD REMOVED,%	72.277	80.063	81.013	79.093	83.038	79.282	85.391	84.862	79.816	78.744	77.603	84.396	82.090	84.387
TSS REMOVED,%	65.323	84.677	94.253	78.767	84.146	85.955	86.413	90.876	78.261	85.955	77.778	85.096	88.889	90.385
BIOMASS LOADING														
BOD5/DAY/ML VSS	0.413	0.619	0.769	0.824	0.770	0.935	0.826	0.893	0.489	0.685	0.483	0.781	0.639	0.847
ORGANIC LOADING														
LB BOD5/DAY/1000 FT3	76.611	107.823	119.806	113.070	122.417	128.170	132.637	152.495	86.589	117.895	86.761	134.866	118.318	150.293
VAPOR PHASE DATA														
O2 SUPPLIED,FT3/HR	4770.797	6202.098	5725.000	6679.199	5725.000	5725.000	9.550	6202.098	6202.098	6202.098	4866.297	6011.297	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	1.124	0.951	0.788	1.045	0.770	0.743	0.001	0.671	1.241	0.928	0.974	0.737	--	--
AERATION BASIN DATA														
MIXED LIQUOR														
TSS,MG/L	3922.537	3587.165	3233.353	2963.150	3283.956	2904.078	3361.468	3463.856	3599.196	3546.262	3668.506	3552.531	3811.297	3642.500
VSS,MG/L	2974.388	2791.561	2497.369	2198.063	2546.725	2196.217	2574.580	2735.791	2837.681	2758.952	2877.828	2767.013	2968.360	2843.471
SVI,ML/GTSS	67.800	77.700	82.800	101.750	84.900	65.650	77.800	79.150	86.200	78.550	85.450	72.500	80.350	76.700
ZSV,FT/HR	6.690	6.140	7.470	7.230	5.780	10.100	7.230	6.690	5.420	6.510	5.420	7.590	5.420	6.500
TEMPERATURE,C **	24.000	24.000	21.000	24.000	24.000	24.000	--	24.000	24.000	24.000	24.000	24.000	25.000	25.000
DETENTION TIME,HR	2.150	1.930	1.637	1.986	1.908	1.893	1.919	1.846	1.885	1.943	1.985	1.921	2.088	2.142
FINAL SETTLER														
OVERFLOW,GAL/FT2/DAY	498.219	554.907	583.021	539.237	561.360	565.969	558.134	580.256	568.273	551.220	539.698	557.673	512.967	500.062
SOLIDS LOAD,LB/FT2/DAY	18.010	17.923	16.768	14.316	16.746	14.754	16.727	17.681	18.332	17.519	17.755	17.629	17.549	16.395
SLUDGE WASTED ***														
SOLIDS WASTED,LB/HR	886.772	630.076	662.579	816.765	837.601	735.088	221.693	1050.125	1050.125	420.050	840.100	775.925	--	--
RETURN SLUDGE														
RECYCLE TSS,MG/L	17712.000	15625.000	17112.000	19025.000	15500.000	15913.000	18700.000	15313.000	16463.000	16638.000	17238.000	18413.000	18750.000	19438.000
RECYCLE RATIO,(RQ)	15.106	12.458	11.099	11.906	13.456	12.117	11.354	9.873	11.946	11.940	12.007	11.140	12.111	12.424

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX A

DATE	9/29/73	9/30/73
INFLUENT WASTEWATER		
FLOW RATE(Q),MGD	11.500	11.200
BOD5,MG/L	170.000	185.000
BOD5,SOL,MG/L	42.000	49.000
COD,MG/L	427.000	488.000
COD,SOL,MG/L	142.000	157.000
TSS,MG/L	172.000	170.000
VSS,MG/L	150.000	160.000
NH3-N,MG/L	--	--
NO3-N,MG/L	--	--
PH	7.300	7.300
EFFLUENT		
BOD5,MG/L	14.000	13.000
BOD5,SOL,MG/L	5.000	4.000
COD,MG/L	87.000	87.000
COD,SOL,MG/L	59.000	47.000
TSS,MG/L	18.000	20.000
VSS,MG/L	14.000	19.000
NH3-N,MG/L	--	--
NO3-N,MG/L	--	--
PH	7.000	7.000
TOTAL REMOVALS		
BOD5 REMOVED,%	91.765	92.973
COD REMOVED,%	79.625	82.172
TSS REMOVED,%	89.535	88.235
BIOMASS LOADING		
BOD5/DAY/ML VSS	0.681	0.694
ORGANIC LOADING		
LB BOD5/DAY/1000 FT3	125.956	133.494
VAPOR PHASE DATA		
O2 SUPPLIED,FT3/HR	--	--
O2 SUPPLIED/BOD REMOVED,LB/LB	--	--
AERATION BASIN DATA		
MIXED LIQUOR	3793.763	3444.395
TSS,MG/L	2965.990	3083.717
VSS,MG/L	80.100	88.400
SVI,ML/GTSS	5.600	5.060
ZSV,FT/HR	24.000	23.000
TEMPERATUPE,C **	2.021	2.075
DETENTION TIME,HR		
FINAL SETTLER		
OVERFLOW,GAL/FT2/DAY	530.020	516.193
SOLIDS LOAD,LB/FT2/DAY	16.099	14.235
SLUDGE WASTED ***		
SOLIDS WASTED,LB/HR	--	--
RETURN SLUDGE		
RECYCLE TSS,MG/L	17525.000	17275.000
RECYCLE RATIO,(R/Q)	0.000	0.000

** BASED ON RAW WASTEWATER FLOW ONLY

*** WASTING RATE IS COMBINED PRIMARY AND SECONDARY STREAMS(EXCLUDING WEIR LOSSES)

APPENDIX B

Month	Sludge Processing (Primary and Secondary Sludges Combined)									Disinfection	
	Filtration Time, hr/day Filter No.		% Moisture	Filter Yield, lb/ft^2/hr	Lime, lb/day	Ferric Chloride, lb/day	Polyelectrolyte, lb/day	Dry Sludge, lb/day	Number Dumpster Loads/Day	Chlorine, lb/day	Avg. Residual Chlorine in Effluent, mg/l
	1	2									
Oct. 71	9.4	7.5	82	5.2	1,840	7,576	131	-	5	700	1.7
Nov. 71	7.6	7.4	75	3.5	715	-	-	-	3	587	1.9
Dec. 71	10.9	10.6	77	3.0	2,733	-	-	-	4	475	2.0
Jan. 72	11.0	11.2	78	4.1	1,815	1,027	257	20,646	5	532	1.8
Feb. 72	11.8	11.9	79	4.1	2,029	781	197	-	5	553	2.1
Mar. 72	7.9	9.0	78	4.3	1,877	1,091	84	-	5	484	2.4
Apr. 72	8.4	8.6	78	6.3	310	826	33	-	7	477	2.4
May 72	8.9	8.8	66	5.3	1,249	1,250	21	-	6	492	2.4
June 72	8.0	8.1	79	5.1	1,220	1,091	33	16,135	6	433	2.3
July 72	6.4	6.4	80	4.8	754	579	15	10,410	4	296	2.4
Aug. 72	11.5	12.1	77	3.7	1,088	1,472	58	17,475	6	349	2.0
Sept. 72	12.1	12.9	78	3.7	1,228	589	60	17,745	6	321	2.1
Oct. 72	13.5	12.7	79	4.0	760	707	59	18,349	5	313	1.9
Nov. 72	14.3	14.3	79	3.3	965	410	41	19,537	6	346	1.8
Dec. 72	11.0	10.9	82	4.1	248	372	42	16,545	6	315	2.1
Jan. 73	7.6	8.0	74	4.5	295	255	29	15,296	5	303	1.8
Feb. 73	9.5	10.9	81	4.5	643	476	42	18,325	7	271	2.1
Mar. 73	10.9	11.7	82	4.5	635	672	48	19,516	8	276	2.2
Apr. 73	9.6	9.6	82	5.2	421	1,012	53	18,664	8	314	2.2
May 73			81	5.3	450	1,152	66	20,403	8	315	1.5
June 73	8.1	8.8	81	5.9	860	668	67	19,296	7	326	1.9
July 73	12.2	12.4	81	4.6	1,116	1,098	76	21,211	8	313	2.2
Aug. 73	16.2	13.1	81	4.2	1,480	1,348	79	22,591	8	313	1.9
Sept. 73	15.7	16.4	82	3.0	1,388	1,049	43	18,009	7	316	1.5

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-600/2-77-040		

4. TITLE AND SUBTITLE	5. REPORT DATE
OXYGEN-ACTIVATED SLUDGE PLANT COMPLETES TWO YEARS OF SUCCESSFUL OPERATION	July 1977 (Issuing Date)
	6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
C. S. McDowell J. Giannelli	

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT NO.
Air Products and Chemicals, Inc. Box 538 Allentown, Pennsylvania 18105	1BC611
	11. CONTRACT/GRANT NO. Contract #68-03-0405

12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
Municipal Environmental Research Laboratory--Cin.,OH Office of Research and Development U. S. Environmental Protection Agency Cincinnati, Ohio 45268	Final, Oct. 1971 - Sept. 1973
	14. SPONSORING AGENCY CODE EPA/600/14

15. SUPPLEMENTARY NOTES

16. ABSTRACT

An OASES^R oxygen-activated sludge secondary wastewater treatment system has been in operation at Fairfax County, Virginia's Westgate treatment plant since October 1971. This report covers the two-year operating period of October 1971 through September 1973, including startup, optimization, routine operations, and operation during upsets. The Westgate plant was converted to oxygen from an existing aeration-sedimentation system operated without sludge recycle. At a cost of $1,700,000, Fairfax County upgraded Westgate from what was essentially a 0.35-m^3/sec (8-mgd) primary treatment facility achieving approximately 50 percent BOD_5 removal to a modern 0.61-m^3/sec (14-mgd) oxygen-activated sludge system achieving on the average 92 percent BOD_5 removal efficiency. Effluent concentrations of 10 to 15 mg/l total BOD_5, less than 5 mg/l soluble BOD_5, and less than 20 mg/l total suspended solids (TSS) have been routinely achieved. The plant has demonstrated a stability of operation and performance not generally available with other biological treatment processes.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Sewage treatment, *Activated sludge process, *Oxygenation, Aeration tanks, Sedimentation tanks, *Liquid Oxygen, Upgrading	*Oxygen-activated sludge system, *Oxygen dissolution, Surface aerator	13B

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